National Universities Commission

Core Curriculum and Minimum Academic Standards for the Nigerian University System (CCMAS)

Agriculture

2022

Ten Unique Features

1. The Discipline philosophy addresses the goals and objectives of the National Policy on Agriculture, which is broader in outlook than in the old BMAS.
2. The courses cutting across the programmes in the Discipline are carefully designed to address the knowledge gaps created by recent advances in technological innovations in agriculture.
3. The practical focus of the courses to be taught makes the curricula enterprise-based to produce adequately-equipped and skilled Agriculture graduates for emerging challenges of food and industrial crop produce supply gap.
4. The CCMAS addresses the entrepreneurial needs of the trainees at the local, national and global levels.
5. The programmes have been repackaged with more specialised courses thus encouraging the production of specialists in the various aspects of Agriculture.
6. The courses in the programmes are designed with deliberate efforts to locate science, economic and social orientation in the training of students.
7. Inclusiveness of the deliverable outcomes in each of the programmes from the teaching of the prescribed core courses for appropriateness and sustainability.
8. The curriculum has been packaged to equip graduates for self-employment as a result of the comprehensive review, enhancement, and invigoration of the one-year Field Practical Year programme.
9. The curriculum is enriched with new courses that ensure a deep theoretical and analytical capability that will prepare graduates effectively for a career in the industry, research and academics.
10. The new CCMAS has new programmes that will increase enrolment in the Discipline and widen the participation of graduates in agricultural and food production in line with national and global objectives.

Executive Secretary: Abubakar Adamu Rasheed

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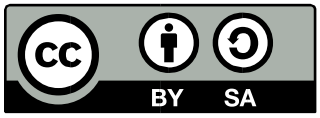

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Foreword

In furtherance of the "change" mantra of the present administration, I published a roadmap to guide my Ministry on ways of addressing the multiple problems that faced the education sector of the country shortly after my assumption of office in 2016. Known as "***Education for Change: Ministerial Strategic Plan – 2016-2019"*** (updated to 2018-2022), the content of the document reaffirms government's commitment to strengthening institutional structures and establishing innovative approaches that would quickly revamp the education sector.

The nations' universities hold a pride of place in the execution of such a strategy, being at the peak of the educational system and charged in an overall manner, with the responsibility of catalysing the sustainable and inclusive growth and prosperity that the "change" mantra envisions. Thus, a "rapid revitalization of the Nigerian university system", which is proceeding apace, became imperative. Improvement in research, teaching and learning facilities, deepening ICT penetration and the provision of enhanced power supply in our university campuses are some of the areas receiving stringent attention. In the same vein, the need was felt to radically review the curricula which universities had used for more than a decade so as to put in place one that would more directly address local issues, meet international standards and is fit for purpose for the training of 21st century graduates.

The National Universities Commission has concluded the review of the former *Benchmark Minimum Academic Standards (BMAS)* of 14 disciplines into those of Core *Curriculum and Minimum Academic Standards (CCMAS)* of 17 disciplines. I am therefore pleased to present these documents to the universities, the general public and the international community as I am sure that their application would tremendously uplift scholarship in our universities. I thank all and sundry who worked assiduously to bring this seminal enterprise to fruition.

Malam Adamu Adamu
Honourable Minister of Education

Preface

Section 10 (1) of the Education (National Minimum Standards and Establishment of Institutions) Act, Cap E3, Laws of the Federation of Nigeria 2004, empowers the National Universities Commission to lay down minimum standards for all universities and other degree awarding institutions of higher learning in the Federation and the accreditation of their degrees and other academic awards. The earliest efforts at giving effect to this legal framework in the Nigerian University System (NUS) started in 1989 following the collaboration between the Commission and Nigerian Universities, which led to the development of the Minimum Academic Standards (MAS) for all programmes in Nigerian universities. The MAS documents were subsequently approved by the Federal Government for use as a major instrument for quality assurance in the Nigerian University System (NUS). The documents were employed in the accreditation of programmes in the NUS for over a decade.

In 2001, the Commission initiated a process to revise the documents because the said MAS documents were essentially content-based and merely prescriptive. In 2004, the Commission developed outcome-based benchmark statements for all the programmes through a workshop that allowed for exhaustive deliberations by relevant stakeholders. Following comments and feedback from the universities to the effect that the Benchmark-style Statements were too sketchy to meaningfully guide the development of curriculum and inadequate for the purpose of accreditation, the Commission, in 2007 put in place a mechanism for the merger of the Benchmark-style Statements and the revised Minimum Academic Standards, which birthed the Benchmark Minimum Academic Standards (BMAS). The resultant BMAS, an amalgam of the outcome-based Benchmark statements and the content-based MAS clearly articulated the Learning Outcomes and competencies expected of graduates of each academic programme in Nigerian Universities without being overly prescriptive while at the same time providing the requisite flexibility and innovativeness consistent with institutional autonomy. In all, the BMAS documents were developed for the thirteen existing disciplines namely, **Administration and Management, Agriculture, Arts, Basic Medical Sciences, Education, Engineering and Technology, Environmental Sciences, Law, Medicine and Dentistry, Pharmaceutical Science, Sciences, Social Sciences and Veterinary Medicine.**

The Commission, in 2016, in its sustained commitment to make the NUS adaptable to global trends in higher education, constituted a group of relevant academic experts to develop a BMAS in **Computing**, thus increasing the number of disciplines in Nigerian Universities to fourteen.

In keeping with its mandate of making university education in Nigeria more responsive to the needs of the society, the National Universities Commission commenced the journey to restructure the BMAS in 2018, introducing in its place, the **Core Curriculum and Minimum Academic Standards (CCMAS),** to reflect the 21st Century realities, in the existing and new disciplines and programmes in the Nigerian University System.

The new CCMAS is a product of sustained stakeholder interactions over two years. The composition of each panel took into consideration, the triple helix model, as a unique feature. This involved a blend of academic experts, academies, government (represented by NUC), professional bodies and of course, the private sector represented by the Nigerian Economic Summit Group (NESG). In order to enrich the draft documents, copies of each discipline were

forwarded to all critical stakeholders including the relevant academic units in Nigerian Universities, the private sector, professional bodies and the academies for their comments and input. These inputs along with the curriculum of programmes obtained from some foreign and renowned universities served as major working materials for the various panels constituted for that purpose.

Bearing in mind the need to adhere to covid-19 protocol as prescribed by the National Centre for Disease Control (NCDC), the Commission was compelled by prevailing circumstances to finalize the curriculum virtually. General Assemblies were also held via Zoom, comprising, the NUC Strategic Advisory Committee (STRADVCOM), Chairpersons/Co-Chairpersons of the various disciplines and Panel Members of the respective programmes. Each Discipline and Programme had NUC representatives who assisted panellists with all the tools and working materials. Several online meetings were held at programmes level, where the real business of developing the CCMAS took place. The products of the various programme-based virtual meetings were submitted to the corresponding discipline group and then to the National Universities Commission. These documents were further scrutinized and fine-tuned by a smaller group of versatile subject matter specialists and relevant private sector practitioners.

In line with the dynamism in higher education provisioning, the Commission took cognizance of complaints by the universities on the high number of General Studies (GST) courses in the BMAS, and was subsequently streamlined. Entrepreneurship courses such as Venture Creation and Entrepreneurship, and innovation found generous space. In addition, the new curriculum unbundled the Bachelor of Agriculture, Bachelor of Science in Mass Communication and the Bachelor of Architecture Programmes, while establishing some emerging specializations in these fields as obtained globally. This is in furtherance of the goal of producing fit for purpose graduates. The Allied Health Sciences was also carved out as a new Discipline from the existing Basic Medical Sciences discipline.

Preceding the completion of the curriculum review content and language editing, a 3-day validation workshop (face-to-face mode) involving critical stakeholders, including STRADVCOM, Vice-Chancellors and Directors of Academic Planning of Nigerian Universities, as well as the Nigerian Economic Summit Group (NESG) was organized by the Commission to validate the CCMAS documents, and to engender ownership for ease of implementation.

Consequent upon the afore-mentioned processes, seventeen CCMAS documents were produced for the following academic disciplines in the NUS:

1. Administration and Management
2. Agriculture
3. Allied Health Sciences
4. Architecture
5. Arts
6. Basic Medical Sciences
7. Computing
8. Communication and Media Studies
9. Education
10. Engineering and Technology
11. Environmental Sciences

12. Law
13. Medicine and Dentistry
14. Pharmaceutical Science
15. Sciences
16. Social Sciences
17. Veterinary Medicine

The CCMAS documents are uniquely structured to provide for 70% of core courses for each programme, while allowing universities to utilise the remaining 30% for other innovative courses in their peculiar areas of focus. In addition to the overall Learning Outcomes for each discipline, there are also Learning Outcomes for each programme and course. In general, programmes are typically structured such that a student does not carry less than 30 credit units or more than 48 credit units per session.

Consequently, the Commission is optimistic that the 2021 CCMAS documents will serve as a guide to Nigerian Universities in the design of curriculum for their programmes with regards to the minimum acceptable standards of input and process, as well as, measurable benchmark of knowledge, 21st century skills and competences expected to be acquired by an average graduate of each of the academic programmes, for self, national and global relevance.

Professor Abubakar Adamu Rasheed, *mni, MFR, FNAL*
Executive Secretary

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Introduction

Two Acts provide the legal framework for the quality assurance and regulatory mandates of the National Universities Commission. The first is the **National Universities Commission Act No. N81 Laws of Federation Nigeria (L.F.N.) 2004**.

This Act sets up the National Universities Commission as a body corporate charged with the responsibility of advising the Federal and State Governments of all aspects of university education and the general development of universities in Nigeria. The second, **Education (National Minimum Standard and Establishment of Institutions) Act No. E3 L.F.N. 2004**, *empowers the National Universities Commission to lay down minimum standards for all universities and other institutions of higher learning in the Federation and the accreditation of their degrees and other academic awards in formal consultation with the universities for that purpose, after obtaining prior approval therefor through the Minister, from the President.*

Following the enactment of NUC Act No. E3 L.F.N. 2004, the National Universities Commission developed the first set of Minimum Academic Standards (MAS) in 1989 for all the academic programmes existing in the Nigerian University System (NUS) at that time under the 13 major disciplines of Administration, Agriculture, Arts, Education, Engineering and Technology, Environmental Sciences, Law, Medicine and Dentistry, Management Sciences, Pharmaceutical Science , Science, Social Sciences and Veterinary Medicine. The Minimum Academic Standard served as the reference documents for the first accreditation of programmes conducted in NUS in 1990.

In its bid to review the Minimum Academic Standard documents, which was predicated on the fact that they were prescriptive, the Commission decided to develop the outcome-based Benchmark Statements for all programmes in the Nigerian University System in line with contemporary global practice in 1999. In the first comprehensive review of the Minimum Academic Standards by NUC, which was in 2004, the Commission decided to merge the Benchmark Statements and the revised Minimum Academic Standards into a new document called Benchmark Minimum Academic Standards (BMAS). These documents were approved for use in Nigerian universities in 2007. A second attempt at reviewing the BMAS was in 2011. It must however be noted that stand alone BMAS for new programmes were at different times developed by the Commission on request from some Nigerian universities.

The Current Review of the BMAS

The journey of the current curriculum review efforts commenced in 2018, when the National Universities Commission circulated the 2018 draft BMAS to all Nigerian universities and other stakeholders for their comments. In addition to the harvested comments, the curriculum of different programmes of some world-class universities were downloaded. The draft 2018 BMAS, compiled comments of Nigerian universities and other stakeholders and the downloaded curriculum of some foreign universities served as the working documents for the curriculum review panels. A multi-stakeholder approach was deployed in constituting the panels for the curriculum review exercise. The constituted panels included:

i. Academic staff of Nigerian universities;
ii. Representatives of the Academies;

iii. Representatives of Professional bodies/associations
iv. Representatives of the private sector

In addition to the reviewers working individually and in consultation with their subject area peers, over 512 cumulative online meetings of the general assembly (Vice-Chancellors, Discipline Chairmen/Chairpersons, programme-specific reviewers and Heads/representatives of international quality assurance agencies and institutions); Discipline groups; and programme groups were held between March and November, 2021. Physical meetings were also held to finalize the curriculum review exercise.

The reviewers carried out their assignments with a view to producing a curriculum for their respective programmes that will reflect both national and international expectations. Specifically, the reviewers focused on ensuring that the emerging curriculum will be adequate to train Nigerian university students in the 21st Century. By implication and in addition to current trends in the various programmatic areas, the curriculum will be ICT oriented, promote Artificial Intelligence, enhance skills acquisition (including soft skills), inculcate and sharpen entrepreneurship mindset of students and capable of steering the deployment of evolving technologies to deliver its content.

The Core Curriculum and Minimum Academic Standards (CCMAS)
The major highlights of the new curriculum are:

1. Change of nomenclature from **Benchmarks Minimum Academic Standards (BMAS)** to **Core Curriculum and Minimum Academic Standards (CCMAS);**
2. The curriculum provides for 70% minimum core courses requirements for graduation. Nigerian universities are expected to provide the remaining 30%;
3. In consonance with global best practice, the curriculum is to stimulate blended learning in its delivery;
4. Mass Communication has been unbundled to create a distinct discipline of Communications comprising degree programmes in Advertising, Broadcasting, Development Communication Studies, Film and Multimedia, Information and Media Studies, Journalism and Media Studies, Mass Communication, Public Relations and Strategic Communication;
5. Agriculture has been unbundled into programmes in its contributing components of B.Sc Agricultural Economics, B.Sc. Animal Science, B.Sc. Crop Science and B.Sc. Soil Science;
6. The unbundling of Architecture and introduction of Architecture as a new discipline with programmes like Architecture, Architectural Technology, Furniture Design, Interior Architecture Design, Landscape Architecture and Naval architecture;
7. The split of the Basic Medical Sciences discipline into two – Basic Medical Sciences and Allied Health Sciences;
8. Reduction of the General Studies (GST) course from 36 credit units to 12 credit units of 6 courses as follows:
    i. Communication in English;
    ii. Nigerian People and Culture;
    iii. Philosophy, Logic and Human Existence;
    iv. Entrepreneurship and Innovation;
    v. Venture creation; and
    vi. Peace and Conflict resolution.

9. Entrepreneurship has been repackaged with the introduction of programme-specific entrepreneurship;
10. The number of academic disciplines has been increased from 14 to 17 as follows:

    i. Administration and Management
    ii. Agriculture
    iii. Allied Health Sciences
    iv. Architecture
    v. Arts
    vi. Basic Medical Sciences
    vii. Communications and Media Studies
    viii. Computing
    ix. Education
    x. Engineering and Technology
    xi. Environmental Sciences
    xii. Law
    xiii. Medicine and Dentistry
    xiv. Pharmaceutical Science
    xv. Sciences
    xvi. Social Sciences
    xvii. Veterinary Medicine

Having reviewed the curriculum of Nigerian universities, the next steps will include training and retraining of academic staff of Nigerian universities to effectively deliver the content of the curriculum.

Glossary of Course Codes

Course Codes are the 3-letter codes for the identification of courses offered in the various programmes in the Agriculture discipline as well as courses offered in other disciplines covered in the CCMAS for the Nigerian University System. They are in three categories dictated by the sources of courses involved:

Category A: Course codes for the General Courses offered by all students.

Category B: Course codes for Faculty Courses offered in the Agriculture Discipline.

Category C: Course codes for Core Courses offered by the various programmes in the Agriculture Discipline.

Table 1: The List of Programmes and Their Course Codes

Category A: Course codes for the General Courses offered by all students

Programme	Course Code
General Studies Courses offered at the University Level by all students.	GST
Entrepreneurship courses offered by all student in the 200 and 300 Levels	ENT

Category B: Course codes for Faculty Courses offered in the Agriculture Discipline

Discipline	Course Code
Agriculture	AGR

Category C: Course codes for Core Courses offered by the various programmes in the Agriculture Discipline

Programme	Course Code
Agribusiness	AGB
Agricultural Economics	AGE
Agricultural Extension	AGX
Animal Science	ANS
Crop Science	CPS
Family and Consumer Sciences	FCS
Fisheries and Aquaculture	FAA
Food Science and Technology	FST
Forest Resources and Wildlife Management	FWM/FRM/WLM
Horticulture and Landscape Management	HLM
Soil Science	SOS
Water Resources Management and Agro-meteorology	WMA

Preamble

The Core Curriculum Minimum Academic Standards (CCMAS) are designed for the education and training of undergraduate students wishing to obtain first degrees in the different areas of Administration and Management Science in Nigerian University System. Presented in this section are the basic operational elements that serve to define the minimum academic standards required to achieve the cardinal goal of producing graduates in Administration and Management Science with sufficient academic background to face the challenges of a developing economy in an increasingly globalized economy.

It is pertinent to note that this CCMAS document is expected to guide institutions in the design of curricula for their Administration and Management programmes by stipulating the minimum requirements. Being such, institutions are encouraged to take due cognizance of the BMAS while bringing necessary innovation to the content and delivery of their programmes towards achieving the overall goal of Administration and Management Science education and training in the country.

Programmes and Degrees

Programmes presented in this CCMAS show distinctly the unbundling of the B.Sc. Agriculture programme and their corresponding degrees as presented in Table 2. These programmes will enable specialisation in the different areas of studies and will help produce graduate that are subject matter specialist. This will help prepare solid materials for postgraduate programmes in the different subject areas and middle level manpower that will that will contribute significantly to the academia and industry.

Table 2: List of Programme(s) and Degree(s) in View

S/N	Programmes	Degree(s) In View
1.	Agribusiness	B.Sc. Agribusiness
2.	Agricultural Science (5-year option)	B. Agriculture
3.	Agricultural Economics	B.Sc. Agricultural Economics
4.	Agricultural Extension	B.Sc. Agricultural Extension
5.	Animal Science	B.Sc. Animal Science
6.	Crop Science	B.Sc. Crop Science
7.	Family and Consumer Sciences	B. Sc. Family and Consumer Sciences
8.	Fisheries and Aquaculture	B.Sc. Fisheries and Aquaculture
9.	Food Science and Technology	B. Sc. / B. Tech
10.	Forest Resources and Wildlife Management	B.Sc. Forest Resources and Wildlife Management
11.	Horticulture and Landscape Management	B.Sc. Horticulture and landscape Management
12.	Soil Science	B.Sc. Soil Science
13.	Water Resources Management and Agro-meteorology	B.Sc. Water Resources and Ago-meteorology

The degree of Bachelor in the respective programme in Table 2 shall be awarded in all Faculties of Agriculture in Nigerian Universities. Classes of degree are to be awarded depending on the Cumulative Grade Point Average (CGPA) obtained by students. The classes of degree that may be awarded are First Class (Honours), Second Class (Honours) Upper Division, Second Class (Honours) Lower Division, Third Class (Honours) and a Pass degree.

Philosophy

The programmes in the agriculture discipline are designed to achieve the goals and objectives of the National Policy on Agriculture in Nigeria, are aimed at restructuring the sector, thus enhancing the sector's capacity in terms of: the production of food for the rapidly increasing population; the supply of raw materials to a growing industrial sector; increasing in the Gross Domestic Product (GDP), thus making it the mainstay of the economy as it were before the advent of oil and gas; the provision of employment to the teaming and jobless Nigerian youths; and providing a major/sustainable source of foreign exchange in Nigeria.

To this end, the overarching objective of the National Agriculture Policy is to strengthen the component parts of the sector (especially, Crop production, Aquaculture and Fisheries, Livestock management, and water and forest resources), for a holistic optimum performance.
Consequently, the Philosophy and Mission Statement underlying the programme are aimed at achieving the goals and objectives of the National Policy on Agriculture. This is in furtherance of Nigeria's renewed commitment for food sufficiency and general self-reliance through the churning out of graduates that are adequately equipped with the comprehensive theoretical knowledge and practical skills required for meaningful engagement in agriculture and agric related fields, thus, making them self- reliance and valuable to the industry and society in general.

Objectives

The objectives of the discipline are to produce graduates:

1. that will contribute significantly to self-sufficiency in food production
2. geared towards self-employment;
3. with sufficient technical and productive skills who will be involved in production, research and entrepreneurship in programmes in the discipline and related disciplines;
4. who are relevant to themselves, the industry and society and who can contribute effectively to national and global development.
5. with the awareness of the need to ameliorate the impact of production and consumption on our environment.

Admission and Graduation Requirements

Admission Requirements

Candidates are admitted into the degree programme in any of the following two ways:

1. Unified Tertiary Matriculation Examination (UTME) (4- or 5-year degree programme)
2. Direct Entry (3- or 4-year degree programme)

Unified Tertiary Matriculation Examination (UTME)

In addition to UTME score, candidates for admission into the B. Agric programme and any other programme in the discipline of Agriculture (except for those seeking for admission into Agricultural Economics and Agricultural Extension) should possess five credit passes in Senior Secondary Certificate (SSC), including English Language and Mathematics, Biology or Agricultural Science and any other two subjects from the following: Chemistry, Physics or Geography in not more than two sittings.

However, candidates for admission into Agricultural Economics and Agricultural Extension are in addition to possessing credits passes in English Language and Mathematics required to possess credits passes in Economics, Geography and Agriculture. with at least passes in Chemistry and Physics, in not more than two sittings.

Direct Entry

Candidates for Direct Entry admission into the B. Agric programme or any other programme in Agriculture except for Agricultural Economics and Agricultural Extension, must have at least 2 credit passes in Advance level in Chemistry and Biology plus Five SSC (or its equivalent) credit pass prescribed for UTME entry mode. HND and Diploma Holders with a minimum of Upper Credit plus Five SSC (or its equivalent) are also eligible for Direct Entry admission. While candidates with Advance level certificate and Diploma are eligible for consideration into 200 level of either the B. Agric programme or any other programme in the discipline of Agriculture, those with HND are eligible for admission into either 200level for 4 year programme or 3 level for the 5 year programme.

For B.Sc. Agricultural Economics and B.Sc. Agricultural Extension, credit passes in Advance level in Chemistry and Biology plus Five SSC (or its equivalent) and those credit passes in advance level in Economics and in one of the three (Geography/Biology/Agriculture) are also eligible for Direct Entry admission, in addition to meeting the prescribed UTME admission requirement. The entry point is as stated above.

Minimum / Maximum Duration

The minimum duration for the Bachelor of Agric programme is 5 academic sessions (10 consecutively-run semesters) while for all the 4 year programmes it is 4 academic sessions (8 consecutively-run semesters) for candidates who enter through the UTME mode. Direct Entry candidates admitted to the 200 level of a 4 year programme or 300 level of a 5 year programme will both spend a minimum of three academic sessions.

Graduation Requirements

A student shall qualify for the award of a Bachelor's Degree when he/she has:

1. completed and passed the prescribed number of courses, including all compulsory courses;

2. obtained a minimum CGPA specified by the University but not less than 1.00, and
3. earned the minimum credit units of not less than 120 for UTME and 90 for DE candidates for 4 year duration programmes and 150 for UTME and 120 for DE candidates for the 5 year duration programme.

General Definition of Common Terms and Principles Governing the Course Unit System and Graduation

Course System

All programmes in the Nigerian University System (NUS) shall be run on a modularised system, commonly referred to as Course Unit System. All courses should therefore be sub-divided into more or less self-sufficient and logically consistent packages that are taught within a semester and examined at the end of that particular semester. Credits are weights attached to a course. One credit is equivalent to one hour per week per semester of 15 weeks of lectures or three hours of laboratory/studio/ workshop work per week per semester of 15 weeks. In addition to the current 15 weeks semester system, universities should be encouraged to inaugurate a blended system which is based partly on physical contacts and partly using virtual or online platforms.

Definition of Course System

This should be understood to mean a quantitative system of organization of the curriculum in which subject areas are broken down into unit courses which are examinable and for which students earn credit(s) if passed. The courses are arranged in progressive order of complexity or in levels of academic progress, such as, Level or year I courses are 100, 101 and Level II or year II courses are 200, 202.

The second aspect of the system is that courses are assigned weights allied to Units.

Units

Consist of specified number of student-teacher contact hours per week per semester. Units are used in two complementary ways: one, as a measure of course weighting, and the other, as an indicator of student work load.

1. As a measure of course weighting for each Unit course (such as) AGR 204 or GST 111), the credit unit to be earned for satisfactorily completing the course is specified; such as a 2-credit unit course in the case of AGR 204 may mean 2-hour lecture per week per semester or for GST 111 implies one 1-hour lecture plus 3-hour practical per week per semester.
2. As a measure of work load, "One Credit Unit" means one hour of lecture or one hour of tutorial per week per semester. For other forms of teaching requiring student teacher contact, the following equivalents may apply: two hours of seminar: three hours of laboratory or field work, Clinical practice/practicum, studio practice or stadium sporting activity, six hours of teaching practice; four weeks of industrial attachment where applicable.

A glossary of all the course codes is presented under Glossary of Codes

Note: Normally, in the Course Credit System, courses are mounted all year round, thus enabling students to participate in examinations in which they are unsuccessful or unable to participate on account of ill health or for other genuine reasons. In such a system, no special provisions are made for re-sit examinations.

The maximum length of time allowed for, in obtaining an honours degree, in the Faculty shall be twelve (12) semesters for the 4-year degree programme and ten (10) semesters for students admitted through the direct entry mode, while for the 5-year degree programme a duration of fifteen (15) semesters and twelve (12) semesters for students admitted through direct entry.

Grading of Courses

Grading of courses shall be done by a combination of percentage marks and letter grades translated into a graduated system of Grade Point as shown in Table 3.

Table 3: Grade Point System

Mark %	Letter Grade	Grade Point
70 – 100	A	5.0
60 – 69	B	4.0
50 – 59	C	3.0
45 – 49	D	2.0
40 – 44	E	1.0
0 – 39	F	0.0

Grade Point Average and Cumulative Grade Point Average

For the purpose of determining a student's standing at the end of every semester, the Grade Point Average (GPA) system shall be used. The GPA is computed by dividing the total number of Units x Grade Point (TUGP) by the total number of units (TNU) for all the courses taken in the semester as illustrated in Table 4.

The Cumulative Grade Point Average (CGPA) over a period of semesters is calculated in the same manner as the GPA by using the grade points of all the courses taken during the period.

Table 4: Calculation of GPA or CGPA

Course	Units	Grade Point	Units x Grade Point (UGP)
C_1	U_1	GP_1	$U_1 \times GP_1$
C_2	U_2	GP_2	$U_2 \times GP_2$
-	-	-	-
-	-	-	-
C_i	U_i	GP_i	$U_i \times GP_i$
-	-	-	-
-	-	-	-
C_N	U_N	GP_N	$U_N \times GP_N$
TOTAL	**TNU**		**TUGP**

$$TNU = \sum_{i=1}^{N} U_i \qquad TUGP = \sum_{i=1}^{N} U_i * GP_i \qquad CGPA = \frac{TUGP}{TNU}$$

Degree Classifications

The following regulations shall govern the conditions for the award of an honours degree.

1. Candidates admitted through the UTME mode shall have registered for and passed at least 120 and 150 units of courses during the 4-year and 5-year degree programmes, respectively.
2. Candidates must have registered and passed all the compulsory courses specified for the programme.

The determination of the class of degree shall be based on the Cumulative Grade Point Average (CGPA) earned at the end of the programme. The CGPA shall be used in the determination of the class of degree as summarized in Table 5. It is important to note that the CGPA shall be calculated and expressed correct to two decimal places.

Table 5: Degree Classification

Cumulative Grade Point Average (CGPA)	**Class of Degree**
4.50 – 5.00	1st Class Honours
3.50 – 4.49	2nd Class Honours (Upper Division)
2.40 – 3.49	2nd Class Honours (Lower Division)
1.50 – 2.39	3rd Class Honours
1.00 - 1.49	Pass

Students who transfer from other universities shall be credited with only those courses deemed relevant to the programmes, which they have already passed prior to their transfer. Such students shall however be required to pass the minimum number of units specified for graduation for the number of sessions he/she has spent in the faculty; provided that no student shall spend less than three sessions (6 semesters) in order to earn a degree. Students who transfer from another programme in the Faculty or other faculties for any approved reason shall be credited with those units passed that are within the curriculum of the programme to which he/she has transferred. Appropriate decisions on transfer cases shall be subjected to the approval of Senate on the recommendation of the Faculty Board.

Probation

A student whose Cumulative Grade Point Average is below 1.00 at the end of a particular year of study, earns a period of probation for one academic session A student on probation is allowed to register for courses at the next higher level in addition to his/her probation level courses provided that:

1. the regulation in respect of student work-load is complied with; and
2. the pre-requisite courses for the higher-level courses have been passed.

Withdrawal

A candidate whose Cumulative Grade Point Average is below 1.0 at the end of a particular year of probation shall withdraw from the University. However, in order to minimize waste of human

resources, consideration should be given to withdrawal from programme of study and possible transfer to other programmes within the same University.

Evaluation

Evaluation shall be done from different perspectives: First, students would be assessed through continuous assessment, examination including external examination and fieldwork. Second, students will evaluate courses, staff, equipment, space, and other aspects of the programme.

Tutorials

The timetable for courses shall be designed to make provision for tutorials of at least one hour for every four hours of lecture. Thus a 3-unit course of 45 hours per semester should attract about 10 hours of tutorials.

Techniques of Students Assessment

Continuous Assessments

Continuous assessment shall be done through essays, tests, and practical exercises.

1. Scores from continuous assessment shall normally constitute 30 – 40 per cent of the full marks for courses which are primarily theoretical.
2. For courses which are partly practical and partly theoretical, scores from continuous assessment shall constitute 40% of the final marks.
3. For courses that are entirely practical, continuous assessment shall be based on a student's practical work or reports and shall constitute 100% of the final marks.

Examinations

In addition to continuous assessment, final examinations should normally be given for every course at the end of each semester. All courses shall be graded out of a maximum of 100 marks comprising:

Final Examination: 70% - 60%

Continuous assessment (Quizzes, Homework, Tests, Practicals): 30% - 40%

Each course shall normally be completed and examined at the end of the semester in which it is offered.

External Examiners' System

The involvement of external examiners from other universities is a crucial quality assurance requirement for all courses in Nigerian University System. In this regard, external examiner should go beyond mere moderation of examination questions to examining of examination papers to scope and depth of examination questions vis-a-vis the curricular expectation.

Students' Evaluation of Courses

There should be an established mechanism to enable students to evaluate courses delivered to them at the end of each semester. This should be an integral component of the course system; serving as feedback mechanism for achieving the following:

1. Improvement in the effectiveness of course delivery.

2. Continual update of lecture materials to incorporate emerging new concepts.
3. Effective usage of teaching aids and tools to maximize impact of knowledge on students.
4. Improvement in students' performance through effective delivery of tutorials, timely presentation of continuous assessment and high quality examination.

The evaluation should be conducted preferably before the final semester examinations. It is very important that students' evaluation of courses be administered fairly and transparently through the use of well-designed questionnaires. The completed questionnaires should be professionally analysed and results discussed with the course lecturer(s) towards improvement in course delivery in all its ramifications.

Maintenance of Curricula Relevance

The Core Curriculum Minimum Academic Standards (CCMAS) of each programme shall be reviewed from time to time to determine the continued relevance and fitness for purpose. The NUC, in its role as the national quality assurance agency on university programmes, shall subject the CCMAS document to review periodically.

It is recommended that Universities review their programmes, at least once in five years, using the current quality assurance CCMAS provisions.

Unless otherwise essential for particular programmes, all Agriculture programmes in a university should be reviewed at the same time. Indeed, because even students from other faculties normally take some of their special electives in the Agriculture, it would be expedient if all courses in the University are reviewed at the same time.

A committee of staff, senior enough and competent to carry out an effective review, shall do each curriculum review. The review shall include an assessment as to ascertain whether the goals and objectives of the programme (as formulated) are still relevant in dynamic, professional and social contexts.

Reviews shall endeavour to incorporate the opinions of relevant stakeholders such as students, staff, external examiners, employers, professional bodies and policy makers.

Each curriculum so revised shall be subjected to consideration and approval at the levels of Department, Faculty/Colleges, and Senate in the University. Specifically, a good review should examine the curriculum and resources in accordance with the following criteria:

1. Re-assessment/re-formulation of goals and objectives of the programme in relation to the needs of the learners and the market requirements, taking into account the broader aspects of the discipline.
2. The market demands of the graduates now and in the future, in terms of skills needed to function as competitive professionals in the current labour market on a global scale.
3. Relevance of the current content in terms of knowledge, skills and attitudes being taught/developed and how these meet the needs of the present and future requirements of the clientele.
4. How the teaching and learning methods meet or fall short of current and future standards of comparable programmes.
5. The quality of teaching and learning material used.

6. Outcomes of learning in terms of success, experience of learners (pass rate, knowledge and skills acquisition, professional capability and integrity) as contributed by the programme.
7. The views of employers and community members on the quality and relevance of the curriculum.

Performance Evaluation Criteria

The accreditation of the Agriculture degree programmes means a system of recognising educational institutions (universities and programmes offered by them) for a level of performance, integrity and quality which entitles them to the confidence of the educational and professional community, the public they serve, and employers of labour.

The objectives of the accreditation exercise are to:

1. Ensure that at least the provisions of the Core Curriculum Minimum Academic Standards are attained, maintained and enhanced.
2. Assure employers and other members of the community that graduates of these institutions have attained an acceptable level of competence in their areas of specialisation.
3. Certify to the international community that the programmes offered in these universities are of high standards and that their graduates are adequate for employment and for further studies.

B.Sc. Agribusiness

Overview

These Core Curriculum Minimum Academic Standards (CCMAS) is designed for the Agribusiness training of undergraduate students wishing to obtain first degrees in Agribusiness in the Nigerian university system. Presented in this Section are the basic operational elements that serve to define the minimum academic standards required to achieve the cardinal goal of producing graduates in the programmes stated above with sufficient academic background and practical exposure to face the challenges of a developing economy in the increasingly globalised world economy.

It is pertinent to note that the CCMAS document is expected to guide institutions in the design of curricula for their agriculture, and agribusiness programmes by stipulating the minimum requirements. Institutions are, therefore, encouraged to take due cognizance of the CCMAS while bringing necessary innovations into the content and delivery of their programmes towards achieving the overall goals of education and training in the country.

Philosophy

The goals and objectives of the National Policy on Agriculture in Nigeria, are aimed at restructuring the sector, thus enhancing its capacity in terms of: the production of food for the rapidly increasing population; the supply of raw materials to a growing industrial sector; increasing the Gross Domestic Product (GDP), thus making it the mainstay of the economy as it were before the advent of oil and gas; the provision of employment to the teeming and jobless Nigerian youths and providing a major/sustainable source of foreign exchange in Nigeria.

Consequently, the philosophy and mission statement underlying the agribusiness programme are aimed at achieving the goals and objectives of the National Policy on Agriculture. This is in furtherance of Nigeria's renewed commitment for food sufficiency and general self-reliance through the churning out of graduates that are adequately equipped with the comprehensive theoretical knowledge and practical skills required for meaningful engagement in agriculture and agriculture related fields, thus, making them self-reliant and valuable to the industry and society in general.

Objectives

The objectives of the agribusiness programme are in tandem with the national needs and priorities in the sector. Therefore, graduates of the programme are expected to be resourceful, creative and knowledgeable, towards solving relevant societal problems. The specific objectives of the programme are to:

1. produce skilled manpower adequately equipped with the comprehensive technology required to function productively and effectively in an agricultural sector characterized by rural settings and vast arable land;
2. assist the nation in its efforts to achieve self-sufficiency in the production of basic food and agricultural raw materials needed for industrialization;
3. modernize agricultural production, processing, storage, preservation and distribution;
4. enhance employment opportunities and attendant improvement in the quality of rural life;

5. adapt and adopt exogenous technology in order to solve local agricultural management problems;
6. ensure that graduates exercise original thought, with sound professional judgment, regarding taking to farming as a profitable business; and
7. produce adequate manpower that will engage optimally in direct production and research, in all aspects of agriculture.

Unique Features of the Programme

The programme's philosophy addresses the goals and objectives of the National Policy on Agriculture. This is broader in outlook than in the old BMAS and relates to all the stakeholders and sectors within agribusiness in theory and practice. It addresses the priorities of agribusiness at the local, national and global levels.

1. The objectives provide a specific and clear pathway to achieve the programme's philosophy and are SMART i.e Specific, Measurable, Achievable, Realistic and Time bound.
2. Agribusiness graduates may also pursue high-flying careers in the multifaceted agricultural industry; and further their education or scientific interest with a career in communications, social services, production, finance, sales or recreation and marketing.
3. Agribusiness students will secure well-paid jobs in a career field that traditionally has unfilled positions every year and get to share their passion for agro-processing, agro-allied and agri-finance.
4. Agribusiness will produce graduate s that are better equipped for further studies in the respective fields and who are better equipped to solve problems in their specializations.

Employability Skills

A degree in agribusiness shows the many different ways of navigating both the commercial and practical sides of agriculture and helping the graduates shape the world's sustainable efforts for years to come. Thus, graduates of this programme will have the highly sought-after skills needed to tackle the problems of globalized agriculture and market, as well as awareness of the problems that have arisen from industrial developments. The graduates will key into many sectors of the economy, and society such as:

1. Prepare students for self-employment and create employment for others as experts or agribusiness enterprises owners.
2. Provide services in agribusiness sector such as agro-allied industries and agro-finance.
3. Provide qualified and sufficient manpower to agro-industrial manufacturing sector of the economy
4. Produce graduates who shall occupy the needed manpower positions in the agro-allied, marketing and financial sectors.
5. Collaborate with other specialist sectors to contribute to economic growth and development.

21st Century skills

Agribusiness combines the scientific theory of agriculture with the creative and practical skills of business. This allows graduates to gain 360 degree understanding of the field and how it can be tailored to the needs of the 21st Century world by engaging and enticing the youths to exploit the great potentialities in:

1. Critical thinking,
2. Creativity
3. Collaboration
4. Communication
5. Information literacy
6. Media literacy
7. Technology literacy
8. Flexibility
9. Leadership
10. Initiative
11. Productivity
12. Social skills

Admission and graduation requirements

Admission Requirements

Candidates are admitted into the degree programme in any of the following three ways:

1. The Unified Tertiary Matriculation Examination (UTME)
2. Direct entry

UTME: Four-Year Degree Programme

In addition to UTME score, the candidate should possess five credit passes in Senior Secondary Certificate (SSC) to include English Language, Mathematics, Biology or Agricultural Science and any other two subjects from the following list: Chemistry, Physics or Geography and Economics in not more than two sittings.

Direct entry mode

Candidates must have at least 2 credit passes in Advance level in Chemistry and Biology plus Five SSC (or its equivalent) credit pass prescribed for UTME entry mode. Diploma Holders with a minimum of Upper Credit plus Five SSC (or its equivalent) credit pass Level at a maximum of two sittings are eligible for consideration for admission into 200-level.

Duration

The minimum duration for the B.Sc Agribusiness programme, is 4 academic sessions (4-year duration) for candidates who are admitted through the UTME Mode.

Direct entry candidates admitted to the 200-level in agribusiness programmes will spend a minimum of 3 academic sessions (3-year duration).

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-

BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course code	**Course title**	**Units**	**Status**	**LH**	**PH**
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	15	45
AGR 201	Introduction to Crop Production	2	C	30	-
AGR 202	Introduction to Agricultural Economics, Extension and Rural Sociology	2	C	30	-
AGR 203	Introduction to Forestry and Wildlife Management	2	C	30	-
AGR 204	Introduction to Animal Production	2	C	30	-
AGR 205	Introduction to Fisheries and Aquaculture	2	C	30	-
AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
AGB 201	Introduction to Business	2	C	30	-
AGB 203	Business Law	2	C	30	
SOS 207	Principles of Soil Science	2	C	30	-
	Total	**22**			

300 Level

Course code	**Course title**	**Units**	**Status**	**LH**	**PH**
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT312	Venture Creation	2	C	30	-
AGB 301	Agribusiness Communication Skills	2	C	30	-
AGB 302	Quantitative Analysis	2	C	30	-
AGB 303	Agribusiness Marketing & Cooperative	2	C	30	-
AGB 304	Agribusiness Management Theory & Practice	2	C	30	-
AGB 305	Management Accounting I	2	C	30	-
AGB 306	Farm Business Management and Production	2	C	30	-

	Economics				
AGB 307	Introduction to Application of Computer in Agribusiness	2	C	30	-
	Total	**18**			

400 Level

Course Code	**Course title**	**Units**	**Status**	**LH**	**PH**
AGB 401	Research Method and Statistics	2	C	30	-
AGB 402	Entrepreneurship and Agribusiness Development	2	C	30	
AGB 403	Financial Mgt. & Policy I & II	2	C	30	-
AGB 406	Econometrics for Agribusiness	3	C	45	-
AGB 407	Agribusiness Investment and Project Analysis	2	C	30	-
AGB 409	Export Management and International Business	2	C	30	-
AGB 498	Seminar in Agribusiness Mgt.	1	C	15	-
AGB 499	Research Project	4	C		180
	Total	**18**			

Course Contents and learning outcomes

100 Level

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students will be able to:

1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents

Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism. Inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations. Copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing. Types of writing.

Summary. Essays. Letter. Curriculum vitae. Report writing. Note making, etc. Mechanics of writing. Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914. Formation of political parties in Nigeria. Nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people. Trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition. Citizenship and civic responsibilities; indigenous languages, usage, and development. Negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation. Re-orientation Strategies: Operation Feed the Nation (OFN). Green revolution. Austerity measures. War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC). Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery AMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

AGG 102: Introduction to Agriculture I (2 Units C: LH 30)

Learning Outcome

At the end of these lectures, students should be able to:

1. have a broad understanding of the concepts and dimensions of agriculture in modern times with emphasis on Nigeria and the tropics;

2. acquire basic knowledge and understanding of the roles of agriculture and the place of soil, crop and animal resources in the production process as well as the constraints they face;
3. be familiar with the role of technologies in the transformation of agriculture; and
4. explain potentials and constraints to sustainable agricultural production

Course Content
Meaning and Scope of Agriculture. Importance of Agriculture to an expanded economy. Agricultural Ecology. Genetics, Agronomy. Rocks and Soil formation. Soil and Water Conservation. Soil Fertility. Land Preparation methods (soil tillage systems). Soil-water-plant relationship. Plant Forms and functions, Growth, Development and Reproduction. Plant Propagation Methods. Cropping Systems, Planting Patterns and Plant Densities. Crop Husbandry, Pasture and Forage Crops. Floriculture, Weeds, Crop Diseases, Crop Pests, Forest management (Silviculture), Crop Improvement, Animal Production, Forms and classification of major farm animals in West Africa, General terminology in animal production, Anatomy and physiology of farm animals, Reproduction in farm animals, Animal Nutrition, Livestock Management, Animal Health, Fisheries and Wildlife, Bee-keeping (Apiculture), Animal Improvement.

AGG 112: Introduction to Agriculture II (1 Unit C: LH 15)

Learning Outcome
At the end of these lectures, students should be able to:
1. Explain the history of agricultural development and the role of the public and private sectors.
2. Identify and analyse the factors of agricultural production and the role of various resources
3. Explain constraints of technology and mechanization, and the role of agricultural extension transformation.

Course Contents
History of Agricultural Development in West Africa, Roles of Government and NGOs in Agricultural Development, Factors of agricultural production, Basic Economic Principles, Characteristic Features of Agricultural Production, Labour Management, Farm Management, Marketing of Agricultural Produce, Agricultural Extension, Agricultural Technology, Farm surveying and farmstead planning, Simple Farm Tools, Farm machinery and implements, Mechanization and sources of farm power, Processing and storage, Introduction to biotechnology, Application of ICT in agriculture, Introduction to agricultural research and statistics

BIO 101: General Biology I (1 Unit C: LH 45)

Learning Outcomes
At the end of lectures, students should be able to:
1. explain cell structure and organisations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents
Cell structure and organization. Functions of cellular organelles. Characteristics and classification of living things. Chromosomes, genes and their relationships and importance. General reproduction Interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism). Heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms). Elements of ecology and types of habitats.

BIO 107: General Biology Practical I (1 Unit C: PH 45)

Learning Outcomes
At the end of the lectures, students should be able to:
1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents
Common laboratory hazards. Prevention and first aid. Measurements in biology. Uses and care of microscope. Compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy, and proportion. Use of common laboratory apparatus and Laboratory experiments designed to illustrate the topics covered in **BIO 101.**

CHM 101: General Chemistry I (1 Unit C: LH 30)

Learning Outcomes
After studying all materials and resources presented in the course, the student will be able to:
1. define atom, molecules, and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionisation energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation–reduction equations and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridised orbitals;
7. identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships.
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure, and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy; and
10. determine rates of reactions and their dependence on concentration, time, and temperature.

Course Contents
Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration. Periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence. Forces. Structure of solids. Chemical equations and stoichiometry. Chemical bonding and intermolecular forces. Kinetic theory of matter. Elementary thermochemistry: Rates of reactions, equilibrium, and thermodynamics. Acids. Bases and Salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 107: General Chemistry Practical I (1 Unit; C: PH 45)

Learning Outcomes
At the end of this course, students will be able to:
1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. tell the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents
Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions. Gravimetric analysis. Data analysis and presentation.

MTH 101: Elementary Mathematics I (2 Units C: LH 30)
(Algebra and Trigonometry)

Learning Outcomes
At the end of the course students will be able to:
1. understand basic definition of set, subset, union, intersection, complements and use of venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. understand various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents
Elementary set theory: subsets, union, intersection, complements, Venn diagrams. Real numbers: integers, rational and irrational numbers. Mathematical induction. Real sequences and series. Theory of quadratic equations. Binomial theorem. Complex numbers. Algebra of complex numbers. The Argand diagram. De-Moivre's theorem. Nth roots of unity. Circular measure. Trigonometric functions of angles of any magnitude. Addition and factor formulae.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes
On completion, the student will be able to:
1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems based on the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents
Space and time. Units and dimension. Vectors and scalars. Differentiation of vectors: Displacement, velocity and acceleration. Kinematics; Newton laws of motion (inertial frames, impulse, force and action at a distance, momentum conservation). Relative motion. Application of Newtonian mechanics. Equations of motion. Conservation principles in physics. Conservative forces. Conservation of linear momentum. Kinetic energy and work. Potential energy. System of particles. Centre of mass. Rotational motion. Torque. Vector product. Moment. Rotation of coordinate axes and angular momentum. Polar coordinates. Conservation of angular momentum. Circular motion. Moments of inertia. Gyroscopes and precession. Gravitation: Newton's law of gravitation. Kepler's laws of planetary motion. Gravitational potential energy. Escape velocity. Satellites motion and orbits.

PHY 107/108: General Physics Practical I & II (2 Units C: PH 90)

Learning Outcomes
On completion, the student will be able to:
1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors; and
4. plot and analyse graphs, draw conclusions from numerical and graphical analysis of data.

Course Contents
This introductory course emphasises quantitative measurements. The treatment of measurement errors and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters. The oscilloscope. Mechanical systems. Electrical and mechanical resonant systems. Light. Heat. Viscosity, etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation. Measurements. Data collection. Analysis and deduction.

CHM 102: General Chemistry II (2 Units C: LH 45)

Learning Outcomes
At the end of this course, students will be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of transition metals.

Course Contents

Historical survey of the development and importance of organic chemistry. Fullerenes as fourth allotrope of carbon. Uses as nanotubules, nanostructures, nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative. Analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanisms and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, students will be able to:

1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which include ignition, boiling point, melting point, test on known and unknown organic compounds;
5. execute solubility tests on known and unknown organic compounds;
6. execute elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents

Continuation of CHM 107. Additional laboratory experiments to include functional group analysis. Quantitative analysis using volumetric methods.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Learning Outcomes

At the end of the course students should be able to:

1. understand types of rules in differentiation and integration;
2. understand the meaning of function of a real variable, graphs, limits, and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents
Function of a real variable, graphs, limits, and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching. Integration as an inverse of differentiation. Methods of integration. Definite integrals. Application to areas and volumes.

PHY 102: General Physics II (Electricity & Magnetism) (2 Units C: LH 30)

Learning Outcomes
On completion, the student should be able to:
1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of AC voltages and currents in resistors, capacitors, and inductors.

Course Contents
Forces in nature; electrostatics, electric charge and its properties. Methods of charging, Coulomb's law and superposition. Electric field and potential, Gauss's law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators. Current, voltage and resistance, Ohm's law and analysis of DC circuits. Magnetic fields; Lorentz force, Biot-Savart and Ampère's laws. Magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances Faraday and Lenz's laws. Step up and step down transformers: Maxwell's equations. Electromagnetic oscillations and Waves. AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

200 Level

GST 212: Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes
A student who has successfully gone through this course should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and

8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents
Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. explain the concepts and theories of entrepreneurship, entrepreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents
Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

AGR 201: Principles of Crop Production (2 Units C: LH 30)

Learning Outcomes
Students will be equipped with:

1. basic agronomic terminologies;
2. knowledge of and basis of crop distribution across climatic regions;
3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification; and
5. knowledge of soil management needs and some conservation practices.

Course Contents

Definitions of the terms, crops and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables and ornamentals.). Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies.

Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.

AGR 202: Introduction to Agricultural Economics, Extension and Rural Sociology (2 Units C: LH 30)

Learning Outcomes

At the end of the course students will be able to:

1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over;
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents

The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions. Cost analysis and functions. Concept of elasticities. Type of markets: perfect competition, monopoly and oligopoly. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation. International trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world. Basic philosophies behind agricultural extension work. The

institutional setting of agricultural extension. Basic concepts and principles of rural sociology. Importance of rural communities and institutions. Social stratification. Social processes and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

AGR 203: Introduction to Forest Resources & Wildlife Management (2 Units C: LH 15; PH 45)

Learning Outcomes

The students will be able to:

1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and
5. raise seedlings of economic tree species.

Course Contents

Renewable natural resources availability. Distribution and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification. Morphology. Taxonomy. Ecology of tropical forest trees and game reserves in Nigeria. Silviculture. Afforestation characteristics of major timbers and their uses. Forest production activities. Forest protection. Regulation of harvests for sustained yield. Importance of forestry and wildlife to the national economy. Practical approach to Apiculture. Snailery. Cane rat farming and other forest enterprises.

AGR 204: Introduction to Animal Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students are expected to have known the following:

1. Prospects and problems of the animal industry;
2. Identification/description of types of farm animals;
3. Feeds and feeding management of farm animals;
4. Housing and management systems of different livestock;
5. Principles of animal health management;
6. Animal breeding and breed improvement principles; and
7. Basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive and reproductive).

Course Contents

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production. Feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and rabbits). Introduction to game and companion animals. General principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation

Anatomy and physiology of the cell. Tissues. Nervous system. Skeletal system. Muscle. Bone. Circulatory system. Reproductive. Digestive. Special senses and other systems of farm animals.

AGR 205: Introduction to Fisheries and Aquaculture (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students will be able to:

1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

Course Contents

Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological. Economic and cultural importance of fisheries park. Zoo. Sport fishing. Marine park, etc. Scope of fisheries and aquaculture.

AGR 206 Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: LH 30)

Learning Outcomes

At the end of this course students should be able to:

1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;

8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

Course Contents
Philosophy. Scope. Objectives. Historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post- harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food. Factors contributing to texture, colour, aroma, and flavour of food. Cost, traditional and ethnic influence of food preparation and consumption pattern.

AGB 201: Introduction to Business (2 Units C: LH 30)

Learning Out
At the end of the course the student should be able to:
1. identify business cycle process to establish an enterprise in agribusiness;
2. identify the functions of business organisations; and
3. analyse challenges facing business enterprises.

Course Contents
Business definitions and scope. The characteristics of business: Social, legal and economic perspectives. Forms of business ownership. Management and characteristics. Functions of business organization: marketing, production, finance and accounting functions. Government and business. The social responsibilities of business. Internal problems of business enterprises in Nigeria. Business environment. Agribusiness: Definition and scope. Characteristics and classification of agribusiness. Based on output and based on stage of production. Prospects and challenges of agribusiness in developing countries.

AGB 203: Business Law (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. provide legal backing to the establishment of business enterprise;
2. apply legal decision in the running of the Agribusiness enterprise;
3. familiarise with the various legal sectors and their jurisdictions; and
4. understand the Conditions governing business transactions with individuals and corporate organisations.

Course Contents
The Nigerian legal system divisions and sources of Nigerian law common law and equity. Case law and precedent. Legislation including the nature and effects of Military Decrees, edicts and statutes. Interpretations. Customary law and Sharia law – meaning and scope. The court

system: Outline of the structure and hierarchy of courts. Officers of the court. Qualifications of judges. Compositions and jurisdictions of various court summons. Outline of the nature of special tribunals. Forms of legal liability substance. Comparison and contrasts between criminal and civil ability. Defamation (i.e libel and slander). Negligent misstatements and passing off. Law of contract-nature and essential elements of a valid contract. Offer and acceptance: consideration formality, capacity, consent vitiating factors. Privity of contract, terms of contracts, discharge of contract, remedies for breach of contract, termination of contract, etc. Law of Agency-its creation and types. Rights and duties of principal and agents termination of agency. Sale of Goods-meaning and types of relevant goods. Conditions: warranties and caveat emptor doctrine, transfer of title and risks. The duties and rights of seller and buyer. Breach of the sale of goods contract and remedies. Law of Tort-Definition of Tort. Tort of Professional negligence, vicarious liability, criminal and civil liability. Hire purchase- its meaning and formation, the right and obligations of the parties. Contract of employment- the nature and formation of contracts of employment, rights and duties of employers and employees, termination and dismissal, and remedies for breach of employment contract, redundancy. Insurance contract- Its meaning, features and outline of concepts and principles; insurable interest, premium, indemnity and fixed sum insurance, subrogation and contribution. Assignment of policy, partnership;- Definitions, nature and types; general and limited partnerships; formation and articles of partnership, types, rights and duties of partners. Relationship of partners with each other and with third partners, dissolution of partnership. Banking and Negotiable instruments. The legal relationship of banker and customer and their mutual duties. The meaning and characteristics of negotiable instruments (Bill of Exchange, Cheques, promissory notes, etc.); Right and duties of the parties to a Bill of Exchange including the rights and duties of the holder in due course. Cheques and their crossing. Trust and Estate. Administration- Appointment, duties, powers, rights and accounts of trustees, executors and administrators. Bankruptcy- Issue of receiving order. Appointment duties and powers of official receiver and trustee in bankruptcy. Statement of affairs and deficiency.

SOS 207: Principles of Soil Science

Learning Outcomes

At the end of taking the Course, students should be able to know

1. The role of the soil as a component of the environment
2. The various disciplines of Soil and Job opportunities as Soil Scientists
3. How soils are formed and the need to use the soil sustainably
4. The various physical, chemical and biological activities taking place in the soil in order to prescribe appropriate management needs
5. The need to survey, classify and map soil for various purposes
6. The various challenges facing the soil under different situations

Course Content

Soil as a natural Resource in the Environment; Sub-disciplines of Soil Science and employment opportunities; Soil Genesis/Formation and Development; Factors of Soil Formation. Soil Composition and Soil Ecosystem Functions; Soil Physical, Chemical and Biological properties (Texture, Structure, Density, Soil Solution, Soil Temperature, Soil Reaction, Salinity, Mineralization, Humification; Ammonification, Nitrification; Soil Organisms and Soil Organic Matter. Introductory Soil Survey, Classification and Mapping. Soil Fertility and Fertility.

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflicts and violence;
3. differentiate between conflict and terrorism; enumerate security and peace building strategies; and
4. describe roles of international organisations, media, and traditional institutions in peace building.

Course Contents
Concepts of peace. Conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts. Structural conflict theory, Realist theory of conflict. Frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes and rivalries. Economic inequalities. Social disputes, nationalist movements and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes etc. Peace building. Management of conflicts and security. Peace & human development. Approaches to peace & conflict management (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice. The Nigeria legal system, insurgency and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis.

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students, through case study and practical approaches, should be able to:
1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. Identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises; conduct entrepreneurial marketing and e-commerce;
7. apply a wide variety of emerging technological solutions to entrepreneurship; and

8. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents
Opportunity identification (sources of business opportunities in Nigeria. Environmental scanning. Demand and supply gap/unmet needs/market gaps/market research. Unutilised resources. Social and climate conditions and technology adoption gap. New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce: principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies).

AGB 301: Agribusiness Communication Skills (2 Units C: LH 30)

Learning Outcomes
By the end of the course the students should be able to:
1. distinguish the various modes of communication elements;
2. appreciate theories of communication for relevant applications;
3. practice to acquire skills of verbal and nonverbal communication; and
4. effectively communicate business activities and transactions both in oral and written styles.

Course Contents
Rudiments of Communication: Communication defined. Elements of Communication, Principles of Communication: Oral, Written and Nonverbal Communication: Language defined, Non-verbal communication, Listening, Oral and written Communication; Functions and settings of Communication. Functions of Communication. Communication setting. Communication theories and Models: Linear Model. Interactional Model. Transactional Model etc. Writing and Communication Methods: Writing defined. Stages of Writing; other Aspects of the Writing process. Corporate and Public Communications. Commercial Communication Method and Letter Writing. Process of Meeting. Conferences. Seminar. Symposium and Debates: Meetings defined. Conduct. Procedures Aims and Benefits/Disadvantages of Meetings. Written Rules Affecting Meetings. Conference. Seminar. Symposium and Debates. Uses of Words. Sentences and Figurative Expressions. Words and their Meanings. Synonyms and Antonyms. Dynamism in Words and Predication. Suffixation. Sentences/Figurative Expression. Reports and Handover notes: Types of Reports, Components of Reports and Handover Notes. Organization communication: The concept of organizational communication. Factors Affecting Effectiveness of organizational Communication. Types of organizational Communication. Public Relations and marketing Communication. Common terminology in Agribusiness communication.

AGB 302: Quantitative Analysis (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. possess the ability to collate reliable data from different sources;
2. handle and manipulate quantitative data;
3. apply different analytical fitted techniques to analyse data; and
4. compute and interpret data for meaningful decision.

Course Contents

Introduction to quantitative application in Business. Tools and concepts of quantitative analysis: probabilities, matrices, calculus etc. Business decision theory and analysis Decision making under certainty. Risk and Uncertainty. Decision rule. Sensitivity analysis. Estimation of cost behaviour pattern. Correlation and Repression analysis etc. Operational Research. Decision theory. Minimal and Maximal regression criterion. Expected value. Linear programming. Inventory and production control.

AGB 303: Agribusiness Marketing and Cooperative (2 Units; C) (LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. learn the history and development of Cooperative societies in the world at large and Nigeria in particular;
2. differentiate types of cooperatives as a social organisation;
3. manage marketing co-operatively by functions and activities; and
4. collaborate with other cooperatives in various enterprises to help one another.

Course Contents

Meaning and history of Agricultural Co-operative. Principles of Agricultural Co-operative. Types of Agricultural co-operatives. Management of co-operatives. Co-operatives in Agricultural development in Nigeria. Women in Agricultural co-operatives. Cooperative laws and legal matters.

AGB 304: Agribusiness Management Theory and Practice (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. identify the various theory personality developer and describe their key characteristics.
2. apply relevant theory models to the current Nigerian situation of Agribusiness management.
3. identify bad business practices and behaviours that may harm business smooth development and sustainability.

Course Contents

Concepts of theory in the physical and social sciences. Levels of theory. The features of theory in management. Links between management theories and management models. Practice of

management conduct as a test of good management theory. Existing difficulties of developing useful management theories in Nigeria and other developing countries. Consideration of simple theories of management from the classics to modern times. For instance; the scientific management movement and the managerial behavioural movement. Theory X and theory The Grid Approach. Participative models. Management by objectives, quantitative and behavioural control models. Testing specific theories from the Nigerian socio-cultural experiences of managing extended family issues, to settling group conflicts of securing productivity at work, of maintaining control over the forces in the environment. Theories observable in the way Nigerian parastatals are being managed. Expatriate management approaches to work in Nigerian organizations. The confluence of management philosophy. Management theory and managerial behaviour in Nigeria. Criteria for locating bad management practices, and ideas of how better management theories may be introduced to particular Nigerian organizations.

AGB 305: Management Accounting I (2 Units C: LH 30)

Learning Outcomes

By the end of the course, the students should be able to:

1. prepare accounting statement of the business enterprise;
2. apply various tool of measuring management performance of the business; and
3. make decisions on the position of the business.

Course Contents

Nature and purpose of management accounting. Overview of management accounting concepts and techniques. Management accounting as a tool of management and its role in a changing environment. Application of marginal costing and absorption costing techniques in decision making. Measuring costs and benefits in making decisions such as dropping assignment/department/production, make or buying decisions, replacement of equipment. Cost volume profit analysis under conditions of uncertainty. Product optimal mix and constraints. Pricing policy decisions. Divisional performance measurements and transfer pricing system. Inventory control and stock levels.

AGB 306: Farm Business Management and Production Economics (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. technically organise factors of production;
2. mix factors of production appropriately for profit making;
3. understand the application of management techniques for optimal production; and
4. perform planning and budgeting of business enterprise to suit current realities.

Course Contents

The farm business environment. Nature and scope of farm business management and production economics. Production function estimation. Analysis production cost. Revenue concepts and their application in farm management decision making. Analysis of the basic

Agricultural production relationships: factor- factor; factor- product; and product- Product Risk Management in farm businesses. Budgeting and linear programming in farm business planning and organization. Farm business analysis using income network and cash flow statements. Challenges of farm business organization and management in Nigeria.

AGB 307: Introduction to Application of Computer in Agribusiness. (2 Units C: LH 30)

Learning Outcomes

After taking the Course, the Students should be conversant with

1. appropriate terminologies and proficiency necessary for Microsoft Word, Excel Spreadsheets and PowerPoint;
2. how to effectively use the Computers to process information, organize and analyze data using different statistical packages;
3. prepare documents for presentations;
4. the use of Computers in surfing the internet for various information, communication and technology (ICT);
5. using Computers in creating Models for Business and Products Development, Market development and Linkages; Products Handling, Transport and Shipment;
6. using Computers for Networking, Advertisement and Invoicing and Market Linkages, etc.; and,
7. internet Services such as Geographic Information System (GIS), etc for various Agribusinesses.

Course Content

Computers and applications in the modern world; Information, Communication and Technology (ICT) revolution and applications in Agribusiness, Agriculture, Environment and the globe. Basic Computing: Microsoft Word Processing and Applications, Spreadsheets, Power Point Presentations. Data Presentations and Management. Computers in Business and Products Development Models, Market Development Models; Computers in Products Handling, Transport and Shipment. Networking, Advertisement and Invoicing, etc. Computers and the Internet Services-Geographic Information System (GIS), etc.

400 Level

AGB 401: Research Methods and Statistics (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. investigate a research problem related to agribusiness enterprise;
2. identify and demonstrate facility in research designs and data collection strategies that are most appropriate to Agribusiness research project; and
3. develop effective writing skills.

Course Contents

Nature, scope and purpose of scientific research in Agribusiness. Basic principles of research design. Research variables and data types. Scaling and questionnaire design. Inferential statistics. Review of sampling techniques. Types of data and collection techniques. Hypothesis testing etc. Data analytical techniques. Chi distribution. Correlation regression. Principal component analysis. Discriminant analysis, etc. Presentation of research finding in narrative, tabular and graphic forms. Guidelines on scientific report writing.

AGB 402: Entrepreneurship and Agribusiness Development (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. identify the nature and characteristics of business organisations;
2. compare and contrast Agribusiness forms of organisations and explain their advantages and disadvantages; and
3. develop a business idea worth of investing as an expert.

Course Contents

Nature and importance of Entrepreneurship in business and societal development. The Entrepreneur self-assessment test kit. Nature of agribusiness and its importance in Agricultural and economic development. Forms of Agribusiness organizations: sole proprietorship, Cooperative, Private Limited Liability Company, Public Limited Liability Company, etc. Prospective Agribusiness ideas worth investing in. Starting up and growing Agribusiness. Effective management of Agribusiness resources such as; finance, personnel, time, equipment, etc. in Agribusiness enterprises. Investment climate and its effect on Agribusiness in Nigeria.

AGB 403: Financial Management and Policy (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. distinguish sources of finance' advantages and disadvantages to business enterprises;
2. practice prudent management of financial capital;
3. use methodological approach to financial investment evaluation; and
4. acquire the knowledge of the measurement of the healthy position of a business investment.

Course Contents

Mathematics of Finance; Time value of money. Compounding methods. Discounting techniques Sources of Finance: short term, median term and long term finance. Relative advantages and disadvantages of the firm structure and types of sources of finance. Capital structure: the effect of financial structure on returns. The traditional position and Modigliani miler hypothesis. - The evidence from empirical studies. The concept of leverage: Finance leverage operating leverage and combined leverage. Cost of capital. The concept of measurement. The overall cost of capital. Working capital management: Inventory management, management of debtors, cash

management and budgeting. Financing analysis. Techniques for measuring forecasting earnings. Cross-section and time series and analysis of accounting indexes. The use of indices in financial analysis. Investment models of asset valuation. Financial ratio, cash flow statements, trend analysis capital budgeting under certainty. Importance of capital budgeting; Capital budgeting criteria NPV and IRR. Evaluation of projects; independent projects, mutually exclusive projects and replacement projects. The effects of capital rationing and inflation. Timing of investments.

AGB 406: Econometrics for Agribusiness (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. source for and handle secondary data;
2. effectively handle quantitative data analysis for Agribusiness investment;
3. have the capacity to manage and use various and relevant Econometric software; and
4. undertake and interpret analysed data.

Course Contents

The nature and scope of econometrics. Correlation analysis and the classical linear regression model (CLRM). Simple regression analysis: the ordinary least squares (OLS) method, the basic assumptions of CLRM, the test of significance of the least squares estimates, multiple regression, functional forms of regression models, Dummy variables, violation of basic CLRM assumptions. Multicollinearity, heteroscedasticity, autocorrelations and application of Computer in regression analysis. Applications of econometrics in Agribusiness: Production. Consumption and Demand analysis.

AGB 407: Agribusiness Investment and Project Analysis (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. describe different types of project investment in Agribusiness;
2. identify types of financial valuation techniques and measurements; and
3. evaluate Agribusiness investments using acceptable procedures.

Course Contents

Definition of investment as the rate of change in capital stock. The environment of investment. The determinants of investment in financial assets project as investment in inter-related assets that together make a production cycle or service. Project evaluation: Types of projects .Nature of project evaluation. Cash flows and accounting profits. Estimating cash flow and tax effects on process and project evaluation techniques. Visual selection method: Capital, recovery period, accounting rate of return. Net Present Value method, the internal rate of return and time Adjusted discounting. Project evaluation in special circumstances: Project size, inequality in project life, replacement decisions, make or business decisions and capital rationing. Leasing decision: Lease or borrowing. Lease or borrow to buy. Project feasibility analysis. Technical analysis.

Economic analysis. Financial analysis and sensitivity analysis. Risk analysis in project evaluation. Security evaluation approaches to security evaluation. Security valuation models. Valuation of bonds. Valuation of equity securities. Dividend and earning. Valuation models. Valuation of convertibles and warrants etc. Technical analysis. The DOW theory Charting techniques and non-charting techniques. Out and call options etc.

AGB 409: Export Management and International Business (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. manage agribusiness enterprises to reflect international standards;
2. identify export commodities and their comparative economic advantage; and
3. develop international skills that will enable them interact with multinational markets and logistics.

Course Contents

Meaning of export Management; Advantage and Disadvantages. Trading overseas Export promotion councils; Management skills required in foreign market freights. Logistics and specialized transport issues for export managers/import managers. Free trade zones and bonded warehouse. Technology in global business. Globalization and management. Export compliance and security management. INCO terms and documentation. Development of Resources in the export supply chain management. Strategy for entry into international markets. Control and management of MNCs. Organizational structure and operating mechanism of MNCs. Board of Directors. Pricing policies. Relationship with Government agencies counting public interest issue. Marketing trade blocks and common market. International financial operation. Definition of Multinational Investment. Issues in Multinationals and third world economic development. The new economic order and the multinationals. Third world multinationals. National and International control of Multinationals.

AGB 498: Seminar in Agribusiness (1Units C: PH 15)

Learning Outcomes

By the end of this course, the students should be able to:

1. select suitable researchable topics of study;
2. search for and analyse related literatures in selected areas of the chosen topics; and
3. develop and demonstrate proficiency in writing and verbal skills.

Course contents

Students are expected to write a research proposal in the light of identified problem(s) in the agribusiness sector. The research proposal is expected to cover the introduction, statement of problem, research objective, research question, hypothesis (if any), Significance of the study. Literature review. Methodology- which should include the statistical and econometric tools of analysis. Research proposal will be presented by the student individually (or in groups) using

appropriate communication and presentation aids. Hard copy of the research to be produced/submitted by the student.

AGB 499: Project Research (4 Units C: PH 1800)

Learning Outcomes

At the end of the course, the students should be able to:

1. identify an investigative research problem;
2. employ data collection instruments, measures, processes to solve problems in Agribusiness; and
3. conduct independent research with minimal supervision.

Course contents

This is the final year research project that is intended to test the student's skill in analyzing and writing research report based on an empirical or library study of a specific subject matter on any topic in Agribusiness related area under the guidance of the Supervisor. The research should be of a problem solving nature. The goal is to develop in the students, the ability to identify problems and to take informed decisions. The product of the students' effort shall be typed and bound in a prescribed format and submitted.

Minimum Academic Standards

Equipment

The required equipment for teaching Agribusiness are:

1. At least 10 PCs for the departmental office.
2. At least 25 PCs for teaching students in a Computer room/Agribusiness Laboratory with Internet facilities and laptops.
3. Each academic staff should have a PC in his / her office with Internet facilities.
4. Overhead and multimedia projectors.
5. One (1) unit of television.
6. Four (4) units of printer (HP Laser Jet 2035 model)
7. Two (2) units of projector (Acer 3600 Luminous/in Focus High-Tech)
8. Four (4) units of projector screen (70 X 70 Inches)
9. Four (4) units of projector stand (Adjustable low tech device)
10. Four (4) units of audio-tape recorder
11. Two (2) units of video player
12. Two (2) units of scanner

List of charts, posters and materials for agribusiness laboratory

1. Export Specification for Fruit Crops
2. Sugar Industry
3. Scope of agribusiness
4. Setting up of an Agro Industry
5. Contract farming to promote agribusiness.

6. A model of consumer decision making
7. Line and Staff Organization
8. Management
9. Functional organization
10. Contract farming
11. Breakeven analysis
12. The dairy industry
13. Functions of production planning and control
14. Types of market Integration
15. Export zones for export of agricultural products
16. Evolution of agribusiness model
17. Agro tourism model
18. Dairy management model
19. Retail management model
20. LCD projector

Agribusiness Incubation Centre

This center may be essential for effective teaching and learning. It would expose the students and staff to the art of start-up of a business by providing services such as management training, marketing links, mentorship, free or low cost workspace etc. Equipment in the center will include;

i. Agri-processing machineries
ii. Packaging machines
iii. Branding machines

Staffing

Academic and non-teaching staff

A key to achieving success in the programme is adequate resource allocation and appropriate utilization. The following areas are important and should to be supported in such a way as to make effective, any resource allocated to the Department.

Academic Staff

1. The established staff/students ratio of 1: 15 for Agribusiness should be met.
2. Training and retraining of academic staff and students should be pursued vigorously.
3. All academic staff should have computing skills.
4. Seventy-five percent (75%) of the academic staff should possess PhDs.
5. At least 20% of the academic staff should be Professors/Readers and 35%, Senior Lecturers.
6. Promotion should be strictly on merit, and that no promotion should be made beyond Lecturer I for those without PhDs. The Department should aim at an equitable gender balance.

Non- teaching staff

The ratio of Academic to non-teaching staff in the University should be 1:2 maximum.
All administrative, secretarial and clerical staff should have computing skills.

Library

There is a need for a Departmental library that has the following feature:

i. A standard physical library with reference text (Journals and recommended textbooks) should be available for the programme
ii. Reference text, recommended text and journals in the library should be of good quality, relevant and adequate.
iii. Recommended text and journals that are very current
iv. There should be evidence of adequate subscription to e-library resources at the department and university main library.

Classrooms, Laboratories, Workshops, and Offices

Offices

i. Lecturers' Offices should be well ventilated, illuminated and adequate in space
ii. The Offices should contain standard tables, chairs, bookshelves, file cabinets, fans/air conditioner depending on status.

Classrooms

i. There should be classrooms designated for the programme
ii. The sizes of the classrooms/lecture rooms should not be smaller than those specified in the NUC space standards.
iii. There should be adequate chairs and tables in the classrooms
iv. The classroom should be well ventilated and illuminated
v. The classrooms should be well equipped with basic facilities: More effective white boards and other facilities such as public address system, flipchart, dusters and lighting should be provided.

The NUC recommends the following physical space requirements:

		m^2
Professor's Office	-	18.50
Head of Department's Office	-	18.50
Tutorial Teaching Staff's Office	-	13.50
Other Teaching Staff Space	-	7.00
Technical Staff Space	-	7.00
Secretarial Space	-	7.00
Academic Staff Research Laboratory	-	16.50
Seminar Space/per student	-	1.85
Laboratory Space	-	7.50

Computer/Econometric/Agribusiness Laboratory List of Software Packages

Agricultural Econometrics Software

Alteryx - analytics platform with drag and drop statistical models; R and Python integration

Analytica – visual analytics and statistics package

ASReml – for restricted maximum likelihood analyses

BMDP – general statistics package

DataGraph - visual analysis with linear and nonlinear regression

DB Lytix – 800+ in-database models

EViews – for econometric analysis

FAME (database) – a system for managing time-series databases

GAUSS – programming language for statistics

GenStat – general statistics package
GLIM – early package for fitting generalized linear models
GraphPadInStat – very simple with much guidance and explanations
GraphPad Prism – biostatistics and nonlinear regression with clear explanations
IMSL Numerical Libraries – software library with statistical algorithms
JMP – visual analysis and statistics package
LIMDEP – comprehensive statistics and econometrics package
LISREL – statistics package used in structural equation modeling
Maple – programming language with statistical features
Mathematica – a software package with statistical particularly ŋ features
MATLAB – programming language with statistical features
MaxStat Pro – general statistical software
MedCalc – for biomedical sciences
Microfit – econometrics package, time series
Minitab – general statistics package
MLwiN – multilevel models (free to UK academics)
NAG Numerical Library – comprehensive math and statistics library
Neural Designer – commercial deep learning package
NCSS – general statistics package
NLOGIT – comprehensive statistics and econometrics package
nQuery Sample Size Software – Sample Size and Power Analysis Software
O-Matrix – programming language
PASS Sample Size Software (PASS) – power and sample size software from NCSS
Primer-E Primer – environmental and ecological specific
Qlucore Omics Explorer – interactive and visual data analysis software
RapidMiner – machine learning toolbox
Regression Analysis of Time Series (RATS) – comprehensive econometric analysis package
SAS (software) – comprehensive statistical package
SHAZAM (Econometrics and Statistics Software) – comprehensive econometrics and statistics package
SigmaStat – package for group analysis
SmartPLS – statistics package used in partial least squares path modeling (PLS) and PLS-based structural equation modeling
SOCR – online tools for teaching statistics and probability theory
SPSS Modeler – comprehensive data mining and text analytics workbench
SPSS Statistics – comprehensive statistics package
Stata – comprehensive statistics package
StatCrunch – comprehensive statistics package
Statistica – comprehensive statistics package
StatsDirect – statistics package designed for biomedical, public health and general health science uses
StatXact – package for exact nonparametric and parametric statistics

Systat – general statistics package
SuperCROSS – comprehensive statistics package with ad-hoc, cross tabulation analysis
S-PLUS – general statistics package
Unistat – general statistics package that can also work as Excel add-in
The Unscrambler – free-to-try commercial multivariate analysis software for Windows
WarpPLS – statistics package used in structural equation modeling

B. Agriculture

Overview

This B. Agriculture programme curriculum is an improvement over the one in the BMAS. Though the B. Agriculture programme of the BMAS has been unbundles in this CCMAS document, it is of the opinion of experts that the B. Agriculture curriculum should not go extinct but be revised to enable students and Universities who may still be interested in this programme to offer it. This new curriculum has been designed to offer better delivery of knowledge and skills in such a way that will help to produce graduates who are perfect fit for the market. The curriculum is core containing seventy percent (70%) of mandatory courses to be taken by students in all universities, it is believed that university Senates will complement this with the remaining thirty percent (30%) to further enrich the curriculum.

Philosophy

The philosophy of the B. Agriculture programme is to achieve the goals and objectives of the National Policy on Agriculture in Nigeria, which are aimed at restructuring the sector, thus enhancing its capacity in terms of: the production of food for the rapidly increasing population; the supply of raw materials to a growing industrial sector; increasing the Gross Domestic Product (GDP), thus making it the mainstay of the economy as it were before the advent of oil and gas; the provision of employment to the teeming and jobless Nigerian youths and providing a major/sustainable source of foreign exchange in Nigeria. This will be achieve through the training of skilled manpower, equipped with broad based knowledge and skills in the different areas of agriculture contributing to knowledge production and dissemination, research, and economic activities in all areas of agriculture.

Objectives

The objectives of the B. Agriculture programme is to:

1. produce skilled manpower adequately equipped with the comprehensive technology required in profitable agricultural production in an environment characterized by rural settings and adequate land endowment;
2. assist the nation in its efforts to achieve self-sufficiency in the production of basic food and agricultural raw materials needed to support the growth of industries in the country;
3. modernize agricultural production, processing, storage, preservation and distribution;
4. enhance employment opportunities and attendant improvement in the quality of rural life;
5. adapt and adopt exogenous technology in order to solve local agricultural management problems;
6. be able to exercise original thought, have good professional judgment and be able to take responsibility for farming as a profitable business.
7. produce adequate manpower that will engage in direct production and conduct research in all facets of agricultural production, extension and rural development along with judicious management of human resources, fund, natural resources and equipment; and

8. improve on indigenous agricultural technology and policies which confirm agriculture as an important part of the national economy.

Unique Features of the Programme

Though the B. Agriculture still largely retains the philosophy and objectives of the BMAS, its unique features lies in the following:

1. It has been reinvigorated with new courses introduced into the unbundled former B. Agriculture programme in this CCMAS that have been designed to deliver higher order learning outcomes;
2. It will enable a better delivery of entrepreneurship in line with the needs of the economy;
3. the objectives provide a specific and clear pathway to achieve the programme philosophy. The objectives are SMART; Specific, Measurable, Achievable, Realistic and Time bound; and
4. It will help produce graduate with a broad knowledge based in the major subject areas of agriculture.

Employability Skills

Graduates of the B. Agriculture programme will have the following skills that will enable them to be meaningfully engaged:

1. **Independence**—the ability to perform research with minimum supervision, developing their own research methods and forming their own conclusions.
2. **Verbal and written communication skills**—the ability to communicate research findings in reports, publications, and courses.
3. **Active listening and interpersonal skills**—the ability to collaborate and communicate with other team members, as well as those in academia.
4. **Time management**—the ability to adhere to schedules, sometimes under stringent deadlines.
5. **Problem-solving skills** – the ability to understand a problem by breaking it down into smaller parts, and identifying the key issues, implications and identifying solutions.
6. **Organisational skills** - being organised and methodical. The ability to plan work to meet deadlines and targets.
7. **Ability to learn and adapt** - to be enthusiastic about work, and to identify ways to learn from mistakes for the benefit of both employee and employer.
8. **Self-motivation** – take pride in personal achievements and ability to bounce back from failures.

21st Century Skills

The programme will lead to the development and acquisition of the following 21st century skills:

1. Critical thinking, problem solving, reasoning, analysis, synthesizing information and interpretation skills.
2. Research skills and practices, interrogative questioning, Leadership, teamwork and collaboration skills.
3. Presentation skills.
4. Oral and written communication and public speaking skills.
5. Perseverance, self-direction, planning, self-discipline, adaptability and ability to take initiative.
6. ICT literacy, media and internet literacy and computer programming skills.

Admission and Graduation Requirements

Admission Requirements

Candidates are admitted into the B. Agriculture degree programme in any of the following two ways:

1. The Unified Tertiary Matriculation Examination (UTME)
2. Direct entry

UTME – Five Year Degree Programme

In addition to UTME score, the candidate should possess five credit passes in Senior Secondary Certificate (SSC) to include English Language, Mathematics, Biology or Agricultural Science, Chemistry and Physics in not more than two sittings.

Direct entry mode

Candidates must have at least 2 credit passes in Advance level or its equivalents in Chemistry and Biology plus Five SSC (or its equivalent) credit pass prescribed for UTME entry mode. Diploma Holders with a minimum of Lower Credit plus Five SSC (or its equivalent) credit pass Level at a maximum of two sittings are eligible for consideration for admission into 200- and 300- levels, respectively.

Duration

The minimum duration for the programmes is 5 academic sessions (5-year duration) for candidates who enter through the UTME mode.

Direct entry candidates admitted to the 200-level in agriculture programmes will spend a minimum of 4 academic sessions (4-year duration) while those admitted to the 300 level will spend a minimum of three years (3-year duration).

Graduation Requirements

To graduate, a student shall have undergone 4 or 5 years of study depending on his/ her entry point, including a one year (12 months) of practical training programme. The activities of the practical year should include periodic seminars on the student's work as a way of stimulating interest as well as the presentation of a written report to be graded at the end of the year. Course workload must meet the graduation requirements. Candidates admitted through the UTME mode shall have registered for at least a minimum of 150 credit units of courses for the 5-year track and 120 credit units for the 4-year (direct entry) track as indicated under course requirements. Candidates must also have registered and passed all the compulsory courses specified for the programme.

The submission of an undergraduate project report based on supervised research is another graduation requirement, which must not be compromised. This requirement exposes the student to problem-solving techniques and provides him/her with an ability to organize ideas from literature and research findings. In short, it prepares the student for the work ahead and for further training at the postgraduate level. This area of academic preparation needs to be maintained and further developed.

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course Code	Course Title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	30	-
AGR 201	Principles of Agronomy	3	C	45	-
AGR 202	Introduction to Agricultural Economics, Extension and Rural Sociology	3	C	45	-
AGR 203	Introduction to Forest Resources and Wildlife Management	2	C	30	-
AGR 204	Introduction to Animal Production	2	C	30	-
AGR 205	Introduction to Fisheries and Aquaculture	3	C	45	-
AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
	Total	**19**			

300 Level

Course Code	Course title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
AGE 305	Data Science and Statistical Computing	2	C	15	45
AGE 306	Application of Computer to Agriculture	2	C	15	45
AGE 307	Introduction to Farm Management and Accounting	2	C	30	-
AGX 311	Principles of Rural Sociology	2	C	30	-
ANS 302	Introduction to Animal Breeding and Genetics	2	C	30	-
ANS 304	Non-Ruminant Animal Production	2	C	30	-
ANS 305	Ruminant Animal Production	2	C	30	-
CPS 301	Arable Crops Production	2	C	30	-
CPS 302	Permanent Crops Production	2	C	30	-
CPS 304	Crop Genetics and Breeding	2	C	30	-
SOS 302	Introduction to Agric. Mechanization	2	C	15	45
SOS 303	Introductory Pedology and Soil Physics	2	C	15	45
	Total	**28**			

400 Level (Practical year)

Course Code	Course title	Units	Status	LH	PH
AGE 404	Farm Records and Accounting	2	C	-	90
AGX 410	Community Agricultural Extension	2	C	-	90
ANS 404	Animal Products, Processing and Marketing	2	C	-	90
ANS 405	Animal Husbandry Techniques (cattle, sheep, goats, poultry, pigs and rabbits)	2	C	-	90
CPS 401	Crop Production Techniques I	3	C	-	135
CPS 403	Crop Protection I	3	C	-	135
CPS 406	Farm Mechanization Practices	2	C	-	90
SOS 402	Soil Survey, Sampling, Classification and Taxonomy	2	C	-	90
AGR 499	SIWES Report	2	C	-	90
	Total	**20**			

The Final Year

During the first four years all students pursue a common programme. In the fifth year they would be allowed to choose options.

In addition to prescribed academic courses in the option area students must carry out a research-oriented project. The project and the course work for the final year should carry a minimum of 30 credit units with the project work accounting for at least 4 units.

The major areas in which a student can choose an option include: Agricultural Economics and Extension, Animal Science, and Crops/Soil Science.

The prescribed course work in the option year should be made up of 80% of courses from the option area and 20% from other major areas of Agriculture.
The approved course to be offered in the various options are as follows:

500 Level Agricultural Economics/Agricultural Extension Option

Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
AGE 501	Agricultural Production Economics	2	C	30	-
AGE 505	Research and Statistical Methods	2	C	30	-
AGX 503	Agricultural Extension Administration and Supervision	2	C	30	-
AGX 504	Programme Planning and Evaluation	2	C	30	-
AGE 510/AGX 599	Research Project	4	C	-	180
	Total	**12**			

500 Level Animal Science Option

Course Code	**Course title**	**Units**	**Status**	**LH**	**PH**
ANS 501	Applied Animal Breeding and Genetics	2	C	30	-
ANS 502	Animal Experimentation and Research Techniques	2	C	30	-
ANS 505	Reproductive Physiology and Artificial Insemination	2	C	15	45
ANS 506	Pasture and Range Production and Management	2	C	15	45
ANS 599	Project	4	C	-	180
	Total	**12**			

500 Level Crop Science/ Soil Science Option

Course Code	Course title	Units	Status	LH	PH
CPS 503	Plantation Crops and Orchard Management	2	C	30	-
CPS 505	Methods of Field Experimentation	2	C	15	45
SOS 502	Soil fertility Management and Plant Nutrition	2	C	15	45
HLM 502	Vegetable crops Production (Olericulture)	3	C	30	45
CPS 599/SOS 599/HLM 599	Final Year Project	4	C	-	180
	Total	**13**			

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units; C) (LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents

Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension

strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people,; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition, citizenship and civic responsibilities; indigenous languages, usage, and development,; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation.; Re-orientation Strategies: Operation Feed the Nation (OFN), Green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

BIO 101: General Biology I (2 Unit C: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. explain cell structure and organizations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;

4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents

Cell structure and organization. functions of cellular organelles. characteristics and classification of living things. chromosomes, genes their relationships and importance. General reproduction. Interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism). Heredity and evolution (introduction to Darwinism and Lamarckism, Mendelian laws, explanation of key genetic terms). Elements of ecology and types of habitat.

BIO 102: General Biology II (2 Units C: LH 30)

Learning Outcomes

At the end of the lectures, students should be able to:

1. List the characteristics, methods of identification and classification of Viruses, bacteria and fungi;
2. state the unique characteristics of plant and animal kingdoms;
3. describe ecological adaptations in the plant and animal kingdoms;
4. explain nutrition, respiration, excretion and reproduction in plants and animals; and
5. describe growth and development in plants and animals.

Course Contents

Basic characteristics, identification and classification of viruses, bacteria and fungi. A generalized survey of the plant and animal kingdoms based mainly on the study of similarities and differences in the external features. Ecological adaptations. Briefs on physiology to include nutrition, respiration, circulatory systems, excretion, reproduction, growth and development.

BIO 107: General Biology Practical I (1 Unit C: PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents

Common laboratory hazards: prevention and first aid; measurements in biology. Uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration,

scaling, accuracy and proportion. Use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101.**

BIO 108: General Biology Practical II (1 Unit C: PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. describe the anatomy of flowering plants;
2. differentiate types of fruit and seeds;
3. state ways of handling and caring for biological wares;
4. describe the basic histology of animal tissues; and
5. identify various groups in the animal kingdom.

Course Contents

Anatomy of flowering plants, primary vegetative body: stem, leaf and root to show the mature tissues namely parenchyma, collenchyma, sclerenchyma, xylem and phloem. Types of fruits and seeds. Care and use of dissecting kits and other biological wares. Dissection and general histology of animal tissues based on vertebrate forms. Morphology and functions of epithelial, muscular, nervous and connective tissues. Examination of various groups of lower invertebrates under microscopes, identification of various groups of organisms in Animal Kingdom. And any experiment designed to emphasize the practical aspects of topics in BIO 102.

CHM 101: General Chemistry I (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. define atom, molecules and chemical reactions;
2. discuss the Modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionization energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation – reduction equation and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridized orbitals;
7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table.

Hybridization and shapes of simple molecules. Valence Forces. Structure of solids. Chemical equations and stoichiometry; Chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry. Rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II (2 Unit C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reactions;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of Transition metals.

Course Contents

Historical survey of the development and importance of Organic Chemistry. Fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The Chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents

Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;
5. perform solubility tests on known and unknown organic compounds;
6. conduct elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents

Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

MTH 101: Elementary Mathematics I (Algebra and Trigonometry) (2 Units: C LH 30)

Learning Outcomes

At the end of this course students should be able to:

1. explain basic definition of Set, Subset, Union, Intersection, Complements and use of Venn diagrams;
2. solve quadratic equations;
3. Solve trigonometric functions;
4. identify various types of numbers; and
5. solve some problems using Binomial theorem.

Course Contents

Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers, integers, rational and irrational numbers. Mathematical induction, real sequences and series. Theory of quadratic equations. Binomial theorem. Complex numbers. Algebra of complex numbers. The Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

MTH 102: Elementary Mathematics II (2 Units C: LH 30) (Calculus)

Learning Outcomes

At the end of this course students should be able to:

1. identify the types of rules in differentiation and integration;
2. describe the meaning of Function of a real variable, graphs, limits and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents

Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of differentiation. Methods of integration, Definite integrals. Application to areas, volumes.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the student should be able to:

1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics.
4. apply Newton's laws to describe and solve simple problems of motion.
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects.
6. explain and apply the principles of conservation of energy, linear and angular momentum.
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Courses Contents

Space and time. Units and dimension, Vectors and Scalars. Differentiation of vectors: displacement, velocity and acceleration. Kinematics. Newton laws of motion (Inertial frames, Impulse, force and action at a distance, momentum conservation). Relative motion. Application of Newtonian mechanics. Equations of motion.Conservation principles in physics. Conservative forces. Conservation of linear momentum. Kinetic energy and work. Potential energy. System of particles. Centre of mass. Rotational motion:Torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates. Conservation of angular momentum. Circular motion. Moments of inertia. gyroscopes and precession. Gravitation: Newton's Law of Gravitation. Kepler's Laws of Planetary Motion. Gravitational Potential Energy. Escape velocity. Satellites motion and orbits.

PHY 102: General Physics II (Electricity & Magnetism) (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the student should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of ac voltages and currents in resistors, capacitors, and Inductors.

Course Contents

Forces in nature. Electrostatics; electric charge and its properties, methods of charging. Coulomb's law and superposition. electric field and potential. Gauss's law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators, current, voltage and resistance. Ohm's law and analysis of DC circuits. Magnetic fields. Lorentz force. Biot-Savart and Ampère's laws. magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances. Faraday and Lenz's laws. Step up and step-down transformers: Maxwell's equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

PHY 107 - General Practical Physics I (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

Course Contents

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

PHY 108 - General Practical Physics II (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs;
5. draw conclusions from numerical and graphical analysis of data; and
6. prepare and present practical reports.

Course Contents

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements. The treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

200 Level

GST 212. Philosophy, Logic And Human Existence (2 Units C: LH 30)

Learning Outcomes

A student who has successfully gone through this course should be able to:

1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and

human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents

Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

AGR 201: Principles of Agronomy (3 Units C LH 45)

Learning Outcomes

Students will be equipped with:

1. basic agronomic terminologies;
2. knowledge of and basis of crop distribution across climatic regions;
3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification; and
5. knowledge of soil management needs and some conservation practices.

Course Contents

Definitions of the terms, crops and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.). Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies.

Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.

AGR 202: Introduction to Agricultural Economics, Extension and Rural Sociology (3 Units C: LH 45)

Learning Outcomes

At the end of the course students should be able to:

1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over;
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents

The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology.

Importance of rural communities and institutions, social stratification, social processes, and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

AGR 203: Introduction to Forest Resources & Wildlife Management (2 Units C: 15 LH; 45 PH)

Learning Outcomes

The students will be able to:

1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and
5. raise seedlings of economic tree species.

Course Contents

Renewable natural resources availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria. Silviculture, afforestation characteristics of major timbers and their uses. Forest production activities. Forest protection. Regulation of harvests for sustained yield. Importance of forestry and wildlife to the national economy. Practical approach to apiculture, snailery, cane rat farming and other forest enterprises.

AGR 204: Introduction to Animal Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students are expected to have known the following:

1. Prospects and problems of the animal industry;
2. Identification/description of types of farm animals;
3. Feeds and feeding management of farm animals;
4. Housing and management systems of different livestock;
5. Principles of animal health management;
6. Animal breeding and breed improvement principles; and
7. Basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc).

Course Contents

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production, feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and

rabbits). Introduction to game and companion animals; general principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation Anatomy and physiology of the cell, tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses, and other systems of farm animals.

AGR 205: Introduction to Fisheries and Aquaculture (2 Units C: 30 LH)

Learning Outcomes

At the end of this course, students will be able to:

1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

Course Contents

Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological, economic, and cultural importance of fisheries park, zoo, sport fishing, marine park, etc. Scope of fisheries and aquaculture.

AGR 206: Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: 30 LH)

Learning Outcomes

At the end of this course students should be able to:

1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;

5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;
8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

Course Contents

Philosophy, scope, objectives and historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post- harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food; factors contributing to texture, colour, aroma, and flavour of food. Cost, traditional and ethnic influence of food preparation and consumption pattern.

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflicts and violence;
3. differentiate between conflict and terrorism; enumerate security and peace building strategies; and
4. describe roles of international organisations, media, and traditional institutions in peace building.

Course Contents

Concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes and rivalries. Economic inequalities, social disputes, nationalist movements and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency and terrorism. Peace mediation and peace keeping.

Peace & Security Council (international, national and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis.

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises; conduct entrepreneurial marketing and e-commerce;
7. apply a wide variety of emerging technological solutions to entrepreneurship; and
8. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies).

AGE 301: Microeconomics Theory (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. analyse household and farm/firm level decision making;
2. estimate profit maximization point and condition for production units;
3. evaluate markets and classify them as perfect and imperfect markets;
4. discuss how market failures can be corrected; and
5. present a seminal paper that confirms that they are sufficiently equipped for further studies at the postgraduate level.

Course Contents

Theory of consumer behavior. Concepts of choice, preference, utility, demand, revealed preference, consumer surplus. Variations to the basic choice model. Technology. Theory of the firm. Static theory of production. Supply of agricultural products by individual farm-firms. Price and output determination. Profit maximization and cost minimization. Walrasian equilibrium. Supply. Perfect and imperfect competition: monopoly, oligopoly and game theory. Market failures and asymmetric information. Welfare economics.

AGE 302: Macroeconomics Theory (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. analyse conditions for economic growth and economic development;
2. explain the linkages between the fiscal and monetary sides of the economy;
3. assess the contribution of agriculture to economic growth and development;
4. analyse the workings of the global macro economy; and
5. present a seminal paper that confirms that they are sufficiently equipped for further studies at the postgraduate level.

Course Contents

Economic growth and economic development. The slow growth model. Analysis of aggregate economic activity in relation to level, stability and growth of national income. Consumption function, investment and savings. Theory of income determination. Interest rate theory. Commodity and money markets. Labour market and unemployment. Inflation. Balance of payment. Monetary policy and aggregate demand. Keynesian theories of money demand. Philips curve and aggregate supply. AD-AS model. Economic development from the perspective of monetary and fiscal policies. Measurement of inequalities.

AGE 305: Data Science and Statistical Computing (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. explain the properties of data;
2. determine appropriate sampling techniques and the use of different data collection instruments;
3. analyse cross-sectional and time series data and interpret the results;
4. formulate hypotheses and make decisions using appropriate test statistics; and
5. apply correlation and regression analyses to solve agribusiness problems.

Course Contents

Basic concepts of statistics. Frequency distribution, measures of location, measures of dispersion. Probability distribution. Normal and binomial distribution. Sampling data collection, data processing techniques, statistical inference, tests of hypothesis – F-test, T-test, Chi-square. Analysis of variance, analysis of covariance. Correlation and regression analyses. Formulation of research objectives, field experimentation, collection and processing of data. Analysis of secondary data.

AGE 306: Application of Computer to Agriculture (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. explain basic information technology terms;
2. use the computer and software packages to create databases; and
3. store information and analyze it using common software such as the Microsoft Excel and Access, SPSS, SAS, R statistics, E Views etc.

Course Contents

Information technology (IT) in information production, storage and retrieval. Information technology in communication, output generation and delivery. It and automation in agriculture. IT applications in agricultural production and marketing, consumption and product utilization.

AGE 307: Introduction to Farm Management and Accounting (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. explain the components of farm management and the function of a farm manager;
2. create different types of farm records and prepare farm budgets;
3. estimate and compare measures of business financial performance;
4. create farm plan using budgeting linear programming approaches;
5. post business transaction into credit and debit categories; and
6. prepare financial statements such as; the profit and loss accounts, balance sheets and trial balance.

Course Contents

Meaning, scope and objectives of agricultural management. Functions and tools of farm management. Effects of socio-economic environment on farm management functions. Steps in farm management decisions. Organization of farm-firm; farm selection, farm layout, enterprise selection and the distribution of investment. The need for farm management information and the positive and normative approaches to farm management information collection. Farm records and accounting. Principles of farm asset valuation and depreciation. Farm budgeting, including complete, partial and breakeven budgeting. Linear programming as a tool for farm enterprise planning. Analysis of farm business performance- measures of efficiency, financial position and farm business size. Book keeping as an accounting tool. Assets and liabilities. Balance sheets and Profit and Loss Accounts. Trial balance. Finance and capital appraisal tools. Depreciation methods and analysis.

AGX 311: Principles of Rural Sociology (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. define rural sociology and make valid comparison with urban sociology on the basis of their special attributes;
2. define and comprehend the basic sociological terms as used in the field of sociology;
3. discuss the major rural social institutions, their functions and roles; and
4. describe leadership dynamics and other rural social processes and their roles in changing the lives of rural dwellers.

Course contents

Meaning, nature and scope of rural sociology. Organization of societies. Basic sociological concepts. Major social institutions. Analysis of the structure of rural agrarian systems and societies. Community characteristics of rural people. Social system. Components or characteristics of a social system. Social processes. Social stratification. Social mobility. Social change. Dimensions of social change and their potentials in the modernization of rural societies. Sources of social change in society. Socialization process. Social conflict and social control. Group dynamics. Internal group dynamics. External group dynamics. The social action processes. leadership patterns. Types of leadership. Implication of rural sociology for extension work.

ANS 302: Introduction to Animal Breeding and Genetic (2 Units C : LH 30)

Learning Outcomes

At the end of the course, the students are expected to have learnt/understood:

1. brief history of genetics enunciating the contributions of Charles Darwin, Gregor Mendel, E. H. Hackel. A. Weisman, W. Batesman etc.;
2. the chromosome compliments of common farn animals (cattle, sheep, goat, pig etc);

3. the helical nature of the DNA molecule and the base pairing system;
4. the role of the DNA and RNA in genetic coding;
5. monohybrid and Dihybrid inheritance using cross diagrams and the Punnet square;
6. how to distinguish between qualitative (descriptive) and quantitative (metric) traits;
7. the different gene actions (additive, dominance, epistasis etc.);
8. the different breeding systems (inbreeding, cross breeding, line breeding etc.), and
9. how to estimate heritability and repeatability of traits.

Course Contents

History of genetics. Chromosomes structure, number and variations. Gene and genotype. Genetic code. Mendelism; fundamental principles of inheritance, quantitative and qualitative characters and their inheritance. Different types of gene actions, values and means, repeatability, heritability etc. Animal variation and selection principles. Breeding and environmental effects, in-breeding, pure line breeding, cross breeding and other breeding methods.

ANS 304: Non-Ruminant Animal Production (2 Units C: LH 30)

Learning Outcomes

At the end of this course students are should be able to:

1. explain clearly the production and management of poultry, swine and rabbits;
2. identify and discuss the attributes, problems and prospects of each species;
3. identify and describe of various enterprises (growing, fattening, hatching, breeder);
4. explain the management practices peculiar to each enterprise (Housing, health, breeding, and feeding) and
5. describe the processing and marketing of stock and products.

Course Contents

Poultry production: problems and prospects. Swine production: problems and prospects. Rabbit production enterprises: problems and prospects. Management systems of breeding stock; broilers, cockerels, ducks and turkeys. Hatchery enterprises and factors affecting hatchery operations. Housing, equipment and feeding principles of poultry, rabbits and pigs. Production and management practices. Livestock Economics. Health management of stock. Processing and marketing of poultry, pigs and rabbits.

ANS 305: Ruminant Animal Production (2 Units C: LH 30)

Learning Outcomes

Students are expected to acquire knowledge of:

1. attributes, problems and prospects of cattle, sheep and goats in Nigeria;
2. identification and description of the various enterprises (meat production, milk production, etc.);
3. management practices peculiar to each species and enterprises in each in terms of:
   -Housing and equipment needs
   -Feeds and feeding requirement

-Health and health management
4. Reproduction management/regulation; and
5. marketing and the economics of these enterprises.

Course Contents

Cattle production: Problems and prospects in Nigeria. Indigenous and exotic breeds of beef and dairy cattle. Dairy and beef production systems. Dairy and beef production enterprises. Sheep and goat production – breeds, management systems. Management of breeding stock, growing and young animal, Housing, equipment and feeding principles of cattle, sheep and goats. Health management of ruminant animals. Marketing of animals and their products.

CPS 301: Arable Crops Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, student will be able to:

1. discuss diversity of arable crops;
2. discuss the need for crop improvement;.
3. explain crop production procedures;
4. describe harvesting and produce handling techniques; and
5. explain the utilization of each crop commodity.

Course Contents

Origin, distribution, soil, and climatic requirements for classes of arable crops, specifically cereals, legumes, root crops, fibre crops, vegetables, and other important arable crops in Nigeria. Concept of improved crop varieties and the importance in crop productivity. Production practices, harvesting, utilization, processing, storage, and economic aspects of some selected major arable crops.

CPS 302: Permanent Crops Production (2 Units C: LH 30)

Learning outcomes

At the end of the course, the students will be able to:

1. identify important plantation crops and discuss their specific production requirements;
2. describe different crop improvement techniques;.
3. discuss the food and industrial relevance of each of the crops; and
4. describe different methods of processing and preservation of the crop produce

Course Contents

Origin, distribution, soil, and climatic requirements of important permanent crops such as cocoa, oil palm, rubber, coffee, coconut, mango, sugar cane, bananas, plantains, citrus, kola, cashew, etc. Production practices, improvement, harvesting, utilization, processing, storage, and economic aspects of some selected permanent perennial crops.

CPS 304: Crop Genetics and Breeding (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students will be able to:

1. explain the basics concepts of genetics and plant breeding;
2. describe specific plant breeding methods;
3. explain the concept of inheritance in crop plants;
4. explain the sexual and asexual methods of plant propagation; and
5. Discuss the place of plant breeding in crop improvement.

Course contents

Cell structure and components, chromosomes; structure, number and variations, linkage and crossing over, mutation and genes in population. Multiple alleles, mitosis and meiosis. Theory of evolution. Fundamental principles of inheritance. Mendelism. Introduction to population and quantitative genetics. Objectives and general principles of crop breeding including their application to self-pollinated, cross pollinated and vegetatively propagated crops. General and special methods of selection in inbreeders and out-breeders; compatibility, male sterility. Heterosis. Polyploidy in crop breeding, and mutation breeding.

SOS 302: Introduction to Agricultural Mechanization (2 Units C: LH 30, PH 45)

Learning Outcomes

Students will be able to:

1. explain the goals and principles of agricultural mechanization. Basic mechanics: force, distance, time, velocity scalar and vector quantities, etc. Principles of two and four stroke engines; internal combustion engines, electric motors. Farm power transmission lines;
2. define and demonstrate importance of mechanization of agricultural practices: from the field to the table. On-site experience of land preparation operations and equipment used;
3. Perform land clearing (felling and stumping), and ploughing, tillage operations (ridging and harrowing); planting/sowing operations, herbicides/pesticides and fertilizer distribution operations;
4. handle some harvesting, handling and transport operations; agricultural produce processing and storage operations and preservation, including safety in use of preservatives and
5. handle some livestock machines and equipment, automated food conveyors, milking watering and meat processing and canning. Planned visits to mechanized agricultural farms.

Course Contents

Goals and principles of agricultural mechanization. Basic mechanics: force, distance, time, velocity scalar and vector quantities, etc. Principles of two and four stroke engines; internal combustion engines, electric motors. Farm power transmission lines. Importance of mechanization of agricultural practices: from the field to the table. On-site experience of land preparation operations and equipment used. Land clearing (felling and stumping), and ploughing, tillage operations (ridging and harrowing); planting/sowing operations, herbicides/pesticides, and fertilizer distribution operations. Harvesting, handling and transport operations; agricultural produce processing and storage operations and preservation, including

safety in use of preservatives. Livestock machines and equipment, automated food conveyors, milking watering and meat processing and canning. Harvesting, handling and transport operations; agricultural produce processing and storage operations and preservation, including safety in use of preservatives.

SOS 303: Introductory Pedology and Soil Physics (2 Units C: LH 30)

Learning Outcomes

Students will be able to:

1. decipher the differences and distinguish between soil and land, between land and landscape;
2. determine how soils are formed, factors and processes involved in soil formation and soil differentiation, the myriad of processes operating within the soil medium concurrently and simultaneously;
3. explain the concept of the soil system as a natural body, as a disperse system and as an open system;
4. describe the peds as the smallest units of the soil structure, levels of structural organization, Soil micro-morphology, and the creation of soil structure and pore volume.
5. discuss the origin of the soils on which all plants/crops are grown, and as the bedrock of agriculture and by direct implication food security;
6. characterize their soils and employ their knowledge of the soil characteristics and manage all types of soils, including problem soils for food production food security;
7. explain the meaning, scope, soil constituents, and their relations with the broad area of soil science, as well as with crop growth and crop development; and
8. explain soil mechanics, heat, light, energy and other classical physics concepts to the soil-plant-atmosphere continuum; the mechanical behaviour (rheological behaviour of the soil mass and the effects of soil physical conditions on plant growth, as well as the management of soil physical conditions for optimal agricultural production.

Course Contents

Introductory: Soil, land and landscape. Processes in the soil environment. Jenny's factors of soil formation: The parent material. Climate, organisms, relief, and time. Soils as the bedrock of agriculture. Soils as non-renewable natural resource. Soils as a disperse system. Peds and pores, levels of structural organization, Soil micro-morphology, the creation of soil structure, pore volume. Approaches to the concept and study of soils: pedological or edaphological? Weathering of rocks and minerals: types of weathering, types of parent materials. Soil profile development: processes and factors of profile development; nomenclature and identification of soil horizons: master and sub-horizons and layers, transitional and combination horizons, suffix symbols, soil catena concept. Reactions and processes of soil genesis: weathering and end-products of inorganic and organic fractions; Inorganic components of soils; rocks and minerals, primary minerals, secondary minerals, clay minerals (1:1 and 2:1). eluviation and illuviation of bases, silica, aluminum, iron, clay, and organic matter; development of pans, nodules, and concretions; progressive soil development; soil orders and the genesis of their diagnostic horizons. Concepts and basic definitions of soil physics. Soil physics as a complementary branch of soil science. Physical & rheological properties of the soil. Mechanical composition of Soils: soil

structure, soil texture, dynamic properties of soils. Soil air and aeration, soil thermal properties, soil water content I (tension etc), Soil water II (energy state forces acting on soil water), Soil water III (flow of water in soil, Darcy's law, Stoke's law, hydraulic conductivity, etc), Soil water IV (water infiltration into soils and soil water re-distribution, infiltration equations). Soil physics applications (Soil water for plants and management of soil physical conditions). Appreciation of soil physical fertility as just important as chemical and biological fertility.

400 Level

AGE 404: Farm Records and Accounting (2 Units C: PH 90)

Learning Outcomes

At the end of the course, the students should be able to:

1. apply the knowledge and skills acquired from the principles and theories taught at the lower levels at the different Industrial training locations or farms where their practical training is situated;
2. prepare formats for different farm records such as production, sales, inventory etc.; and
3. analyze and interpret organizational financial performance from their financial records.

Course Contents

Objectives of records and accounts. Types of records. Importance of production records. Analysis of farm records. Farm inventory-valuation and depreciation. Farm financial accounts. The farm as a firm.

AGX 410: Community Agricultural Extension (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. explain the value of group formation in community and apply collective approach to solving community problems;
2. collect field data and analyse; and
3. plan and execute development interventions in a community.

Course Contents

Concept of community. Groups in community. Social change and agents of change. Use of participatory tools in problem identification and solution. Survey methods. Data collection/questionnaire administration. Use of interventions in community development.

ANS 401: Bio-security and Animal Health Management (2 Units C: PH 90)

Learning Outcomes

At the end of this practical, hands-on activity, the student is expected to have learnt how to:

1. identify the various portals of disease entry into an animal farms;
2. prevent disease outbreak on animal farms;

3. construct vehicle dip at the entrance of an animal farms;
4. construct foot dip at the entrance of animal pens/houses;
5. control human and vehicular movements in and out of animal farms;
6. use various disinfectants and acaricides to control pests and diseases on animal farms;
7. carry out drenching, dipping, dehorning, and drug administration;
8. isolate and treat sick animals;
9. quarantine animals coming into the farm from different locations;
10. control the use of equipment and/or human resources between pens and animal houses; and
11. observe strict sanitary measures on animal farms.

Course Contents

Disease causative organisms. Symptoms, diagnosis, treatment and control of common livestock diseases. Ecto- and endo-parasites and their control measures. Nutritional diseases of monogastric and ruminant animals. Basic health management operations (identification aids, dehorning, debeaking, hoof trimming, dipping, castration and drug administration). Care of sick animals – isolation, quarantine and culling. Public health, significance of animal diseases and common zoonotic diseases.

ANS 402: Livestock Recording, Identification and Traceability (2 Units C: PH 90)

Learning Outcomes

At the end of this practical hands-on activity, the student is expected to have learnt how to:

1. keep routine farm records such as purchases, mating/breeding records, production records, vaccination/herd health records, etc;
2. identify each animal on the farm through naming, ear tagging, branding, tattooing, ear-notching, etc;
3. use modern methods of animal identification such as micro-chip inplants, radio wave frequencies, etc;
4. carry out contact tracing in disease surveillance; and
5. easily identify sick animals for isolation and treatment.

Course Contents

Animal identifications. Methods of animal identifications: naming, ear-tagging, skin branding, tattooing, ear-notching, electronic/digital. Routine farm records: farm purchases, mating/breeding records, production records, vaccination/herd health records. Identification of sick animals for isolation and regular treatment.

CPS 401: Crop Production Techniques I (3 Units C: PH 135)

Learning Outcomes

At the end of the course, students will be able to:

1. perform initial aspects of crop production enterprise; and
2. plan for and initiate crop production activities.

Course Contents
Selection of seeds and other propagules for planting. Land clearing/preparation and tillage. Planting techniques and appropriate plant population management.
Early crop management practices for good crop establishment.

CPS 403: Crop Protection I (3 Units C: PH 135)

Learning Outcomes
At the end of the course, trainees would have:
1. competence in field insect pest management;
2. ability to identify specific disease symptoms on crops; and
3. competence in overall crop protection in crop production enterprise.

Course Contents
Practical identification of pests and disease pathogens on crop field. Familiarization with and mode of use of pest and disease control equipment. Practical involvement in insect pest management, disease control on diverse crops, nematode management. Practical aspects of phytosanitary.

CPS 406: Farm mechanization Practices (2 Units C: PH 90)

Learning Outcomes
At the end of the course, students will be able to:
1. have Adequate knowledge of farm machines and implements;
2. have sufficient skill in tractorization activities in crop cultivation; and
3. appreciate of the inherent need for mechanization in crop production.

Course Contents
Familiarization with farm machines. Farm implements, their uses and coupling methods practically demonstrated. Tractor operation for basic field operations – ploughing, harrowing, and ridging. Involvement in equipment and tractor routine maintenance activities.

SOS 402: Soil Survey, Sampling, Classification and Taxonomy (2 Units C: PH 45)

Learning Outcomes
Students will be able to:
1. know the land-use act, land tenure system in Africa, and how to commence entrepreneurship and establishment of large/Small scale farms; basic principles of land surveying, simple surveying mathematics;
2. practice chain surveying and plot graphs of details; make use of compass instrument; theodelite, ranging poles, levelling equipment, maps and practice map reading;
3. carry out photogrammetry and photo-interpretation;

4. explain the importance of soil surveys and the need to classify soils, soil survey scales and kinds of soil survey, soil mapping units, soil survey operations and what relationships exist between soil genesis and soil surveys;
5. define and describe concept of benchmark soils, defining soil series. Soil survey reports: essence of soil classification, types of soil classification (natural and technical), basic characteristics of the United States Division of Agriculture (USDA) soil orders and their Food and Agriculture Organization of the United Nations (FAO) and World Resources Board (WRB) equivalents;
6. describe basic problems associated with the soil orders, management of soil orders for agricultural and other purposes, profile characteristics of major soil orders in Nigeria; and
7. perform Soil classification in relation to land use suitability for rain-fed and irrigated agriculture, land capability, productivity indices. Presentation and interpretations of soil survey results and information.

Course Contents

The importance of soil surveys and the need to classify soils. Guides to soil surveys: soil survey scales and kinds of soil survey, soil mapping units, soil survey operations. Understanding what we see in terms of soil genesis: concept of benchmark soils, defining soil series. Soil survey reports: essence of soil classification, types of soil classification (natural and technical), basic characteristics of the USDA soil orders and their FAO (WRB) equivalents, basic problems associated with the soil orders, management of soil orders for agricultural and other purposes, profile characteristics of major soil orders in Nigeria. Soil classification in relation to land use suitability for rain-fed and irrigated agriculture, land capability, productivity indices. Presentation and interpretations of soil survey results and information. Selection of soil sampling spots; criteria for selecting sampling spots in the field, greenhouse potted soils, nursery sites, plantation sites, polluted sites etc. Sinking of soil profiles and soil profile description: morphological properties. Methods of taking soil samples from land surfaces and soil profile pits for physical, chemical, and biological properties for purposes of characterization, classification, fertility assessment, fertilization and engineering and mineralogical studies. Appreciation and use of simple soil sampling tools and equipment in the field. Quality control and quality assurance measures in transportation of samples, storage of samples.

AGR 499: SIWES Report **(2 Units C: PH 45)**

Learning Outcomes

At the end of the course, the students should be able to:

1. write a report of the practical year activities and demonstrate the ability to present it; and
2. explain how to establish an agricultural enterprise.

Course Contents

Scientific writing and farm record practices. Submission of final report on practical year/Students Industrial Work Experience Scheme (SIWES).

500 Level

AGE 501: Agricultural Production Economics (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. critique common production functions, specify production functions and determine the optimal level of production and input/factor use;
2. derive equations for farm input demand and output supply functions;
3. use production data to estimate technical, allocative and economic efficiencies; and
4. use linear programming for farm decision making.

Course Contents

The nature of agricultural production problems, goals and objectives of agricultural production. Principles of resources use with particular reference to the optimum level of resources use. Principles of optimum product combination. Empirical production functions. Supply and cost elasticity. Production and production planning in agriculture using the methods of linear programming and simulation; production decision making under risk and uncertainty; types of production risks and uncertainties in agriculture. Production diversification and risk minimization. Uncertainty management with the use of subjective probability and the game against – nature approaches.

AGE 505: Statistical and Research Methods (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. Conceptualize a research problem and design a research plan;
2. apply appropriate sampling techniques to obtain samples from natural populations;
3. design data collection instruments and undertake data collection through interviews and the use of questionnaires;
4. analyse, present and report results of collected data; and
5. formulate study hypotheses and make statistical decisions using the t, f, and chi square, and other statistics.

Course Contents

Estimate and interpret correlation and regression analyses using data collected from field surveys. Methodology and problems of farm and market surveys for data collection. Sampling techniques, including simple random, stratified random, cluster and systematic sampling techniques. Tabulation and presentation of statistical data with emphasis on histograms, graphs and frequency distributions. Measures of central tendency: mean (arithmetic and geometric), mode, median, quartiles and deciles. Measures of dispersion: variance, standard deviation, skewness and kurtosis. Probability distributions binomial, normal, poisson, e.t.c. Statistical inference point and interval estimation. Test of hypothesis. Correlation analysis, simple linear, multiple and partial correlation. Simple linear and multiple linear regression analyses.

AGE 510/ AGX 599: Research Project (4 Units C: PH 180)

Learning Outcomes

At the end of the course, students should be able to:

1. formulate a research problem and develop a research proposal;
2. carry out a field survey or source of secondary data, analyze the data using appropriate analytical tools and computer software; and
3. interpret the results and write a project report.

Course Contents

Formulation of problem statements and development of research objectives and hypothesis. Analytical research methods: descriptive, statistical/quantitative and judgmental; primary data collection; sources and collection of secondary data. Presentation of research findings in narrative, tabular and graphical forms. Report writing.

AGX 503: Agricultural Extension Administration and Supervision (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to

1. explain the meaning of administration in extension;
2. apply the concept of supervision in extension work; and
3. evaluate the performance of an extension organization in discharging its responsibilities.

Course Contents

Concept, theories, principle and guidelines of administration. Organization and supervision of agricultural extension services in Nigeria. Current status of extension administration in Nigeria. Staff recruitment, selection, placement and supervision. Budget development and fiscal control. Public relations in extension. Concept of leadership and leadership dynamics. Monitoring of programmes. Evaluation of programmes. Assessment of extension work accomplishment.

AGX 504: Extension Programme Planning and Evaluation (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. define administration in extension, monitoring and evaluation and their functions in extension work;
2. appreciate community participation in development projects; and
3. differentiate between monitoring and evaluation.

Course Contents

Planning process. Principle and concept of programme planning. Steps in planning. Concept of monitoring and evaluation. Importance of program planning in agricultural extension. Clientele participation. Plan of work and calendar of work. Evaluation approaches. Logic models for programme evaluation. Corruption and its implication in agriculture and the economy.

ANS 501: Applied Animal Breeding and Genetics (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students are expected to have known:

1. the common metric characters in farm animals;
2. continuous and discrete variables;
3. how to compute the measures of central tendency and dispersion in economic traits;
4. how to partition the phenotypic variation into the genetic and environmental components;
5. how to estimate heritability and repeatability of economic traits, their genetic and phenotypic correlations;
6. common selection principles in Animal Science; and
7. breeding systems and the concept of genotype x environment interaction.

Course Contents

Characters of economic importance in farm animals. Statistical tools for studying inheritance. Partitioning phenotypic variance and covariance. Estimation of genetic parameters (heritability, repeatability, genetic correlations). Selection principles and methods. Breeding (mating) systems. Breeding plans for different farm animal species. Foundation stock development. Genotype by environment interaction.

ANS 502: Animal Experimentation and Research Techniques (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students will understand:

1. what an experiment is, the various steps taken to set up an experiment and formulate hypotheses;
2. how to conduct animal experiments in the different areas of Animal Science;
3. the basic statistical designs in animal experiment and when and how to deploy each;
4. how to collect and collate experimental data; and
5. how to employ appropriate statistical tools for data analysis, interpretation and results presentation.

Course Contents

Planning of experiments. Research techniques in animal Science; Dairy Science research, physiological research, applied genetics, animal nutrition research i.e. germ free animals, Annulations, Colostomy. Research techniques in pasture. Basic statistical designs in animal science research: Completely randomized design (CRD), Randomized complete block design (RCBD), Hierarchical design, repeat design, Animal model, etc. Analysis, interpretation and presentation of results.

ANS 505: Reproductive Physiology and Artificial Insemination (2 Units C: LH 15; PH 45)

Learning Outcomes

The students are to know the following at the end of the course:

1. reproduction and the involvement of mature male and female animals in the act of reproduction;
2. male and female reproductive organs of the major parts in reproduction;
3. male and female gametes to be viewed under microscope to appreciate their forms and functions for the foetus/embryo formation;
4. AI with its merits and demerits side by side with natural insemination in livestock production. The role of male and female animals in AI, embryo transfer etc.; and
5. management practices in terms of feeding and handling that improve and encourage reproduction among farm animals.

Course Contents

The reproductive systems in male and female animals; Physiology of sperm and ovum. Endocrinology; reproduction, Egg production, pregnancy and foetal development. Fertility and sterility of farm animals. Role of AI in livestock production. Cloning, embryo transfer. Management of male donors; semen collection, evaluation, preservation and storage. Artificial insemination techniques.

ANS 506: Pasture and Range Production and Management (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. distinguish between pasture and forage;
2. know the common and botanical names of common indigenous and foreign pasture and forage species;
3. establish and maintain a pasture land;
4. establish a fodder bank; germplasm collection, preservation and storage; and
5. understand what range management is.

Course Contents

Adaptation and botany of indigenous and introduced pastures and forage plants. Characteristics of grasses, legumes and shrubs. Establishment, production and seed production of pasture plants; the utilization and maintenance in permanent and temporary pastures. Forage legumes and their roles in tropical farming system. Fodder bank technology; shrubs and trees legumes. Agronomic management for seed production. Seed harvesting, processing and storage. Germplasm collection, preservation and storage. Range Management; Grazing Systems; Forage conservation, dry season feeds. (2 hour of lectures and 1hour of practicals per week).

ANS 599: Project (4 Units C: PH 180)

Each student is expected to choose and execute a special project under a supervisor. Duration of the project is 2 semesters.

CPS 503: Plantation Crops and Orchard Management (2 Units C: LH 30)

Learning Outcomes

1. Students are groomed with a theoretical background which would help in practical handling of requirements for production of arable and tree crops; and
2. Distinguish the peculiarities in the production practices for arable and plantation crops.

Course Contents

Soil and climatic requirements; growth requirement, weed control and water use. Improved varieties; production practices, diseases and pests, harvesting, handling, processing, storage, marketing, and utilization of field and plantation crops. Growth requirements of cereals, root, tubers, sugar crops, cocoa, citrus, oil palm, etc. Management and production of field crops. Fertilisation; water use and weed control.

CPS 505: Methods of Field Experimentation (2 Units C: LH 15; PH 45)

Learning Outcomes

1. At the end of the course, learners should understand the concept experimentation, its purpose, and procedure; and

2. They should have a bit of the knowledge of data collection, collation, and analysis.

Course Contents

Principles of field experimentation in crop science. Research methodology; experimental plot layout and experimental designs, field survey; normal distribution and sampling; measurements and data analysis. Sources of variation in field experiments. Single factor and factorial experiments. Analysis of variance, data transformation and means separation. Data collation and interpretation. Concept of mean, standard deviation, standard error, least significant difference, Duncan's multiple range test. Result presentation in tables and figures.

SOS 502: Soil Fertility Management and Plant Nutrition (2 Units C: LH 15, PH 45)

Learning Outcomes

At the end of the course, students will be able to:

1. define and describe the basic concepts; that even a highly fertile soil gets exhausted of its reserves nutrients as crops are grown and harvested continuously and needs replenishment. Linking of knowledge of soil fertility and soil fertility management to soil productivity, and ultimately to agricultural input and output Management, presents the key to sustainable agriculture and food security worldwide;

2. describe the natural resource endowment of soils in soil organic matter, which at the primary levels of training are referred to as humus; appreciate the role of soil organisms in the processes of organic matter formation and the changes in plant and animal remains due to activities of soil organisms; properties of soil organic matter and factors affecting the rate of organic matter decomposition;
3. describe organic matter of mineral soils and organic manures, The carbon cycle. The C/N ratio; compost and composting and other forms of organic source. Nutrients for plant growth. The pathway of nitrogen, phosphorus and sulphur, potassium, calcium and magnesium. Trace elements;
4. explain the prime importance of soil fertility restoration, improvement, and maintenance of the productive capacity of the soils, but also for a priori diagnosing soil clinical needs for overall productivity capacity of soil-plant relationship;
5. demonstrate the application of integrated soil fertility management to overcome problems of mismanagement of fertilizers (excessive application, inappropriate mixes of organic and inorganic fertilizer elements etc.);
6. discuss the plant-soil interface, as supplemental to their knowledge of soil fertility and soil management course and for their anticipated roles as crop-farm managers of the future; and
7. describe plant mineral nutrition aspects of plant physiology and the diagnostic techniques for plant nutrition which enables these graduates to advise farm owners at all levels, especially for early detection of mineral nutrient element deficiencies and indeed early incidences of toxicities and excessive accumulation.

Course Contents

Concepts in soil fertility. Soil fertility versus soil productivity. Soil productivity and fertilizer use. Fertility of tropical soils and its management. Origin of soil organic matter. The soil organisms. Changes in plant and animal remains due to activities of soil organisms. Properties of soil organic matter. Factors affecting the rate of organic matter decomposition. Organic matter of mineral soils and organic manures. The carbon cycle. The C/N ratio; compost and composting and other forms of organic source. Nutrients for plant growth, The pathways of nitrogen, phosphorus and sulphur, potassium, calcium and magnesium. Trace elements. Wetland soil fertility and its management. Lime, liming materials and soil fertility management. Practical management of soil nitrogen, sulphur and soil fertility maintenance. Supply and availability of phosphorus and potassium. Micronutrient elements, Micronutrient needs and fertility management. Crop growth response to soil nutrients. Fate of nutrient elements in the soil (crop removal, leaching, erosion, volatilization, denitrification and fixation).Sustaining soil fertility. Principles of mineral nutrition of plants. Plant growth and root development in soils (photosynthesis and nutrient uptake by roots, water use and efficiency). Chlorophyll formation and chlorosis. Range of inorganic mineral elements in plants. Essential and non-essential elements (major, secondary and trace elements) in crop nutrition. Importance of select-nutrients in plants. Root development and mode of action of the mineral nutrients (nutrient absorption, nutrient balance, maintenance, and loss of nutrients in soil fertility. Soil factors influencing nutrient availability. Plant nutrient status and diagnostic techniques for plant nutrition (visual symptoms of deficiencies, chemical analysis of plant parts or saps, plant tissue

tests, measured plant response to added nutrients). Mineral nutrients deficiencies versus toxicities.

HLM 502: Vegetable Crops Production (Olericulture) (2 Unit C LH 15; PH 45)

Learning Outcomes

The course will equip the students with entrepreneurial skills in vegetable production through learning of:

1. the scope of the olericulture industry, and the benefits that this industry provides;
2. grouping of vegetable crops for food and economic gains; and
3. the influence of the environment on the growth of vegetable crops.

Course Contents

Concept of vegetable crops production. Economic importance of vegetable crops. Major types of vegetable crops - indigenous, exotic, and wild vegetables. Principles and practice of vegetable crops production. Factors (climatic and soil requirements) influencing site selection, establishment, production, and management. Ecological distribution of vegetables and fruits in Nigeria. Methods of propagation. Nursery system and factors affecting it. Varieties and adaptation of exotic vegetables and fruits to the Nigerian environment. Production practices, diseases and pests, harvesting, handling, processing, storage, and marketing opportunities.

CPS 599/SOS 599/ HLM 599 – Final Year Project (4 Units; C PH 360)

Each student is expected to choose and execute a special project under a supervisor. Duration of the project is 2 semesters.

Minimum Academic Standards

Laboratory Requirements

Agricultural Economics/ Agricultural Extension Option

For agricultural economics training, the socioeconomic laboratory is a compulsory facility. The components of the laboratory for a class of 50 students are as follows:

1. Air conditioned computer laboratory with 55 computer tables and chairs;
2. 55units of computer systems;
3. 1 server unit
4. 5 printers
5. 1 unit of scanner
6. Broadband internet connection
7. Licensed copies of SPSS, STATA, e-view, R statistical packages
8. 2 units of projector
9. 2 units of projector screen
10. 2 units of white board
11. 60 sit capacity seminar room (60 Chair with arm rest)
12. Lecture delivery podium

Agricultural Extension Studio

1. Well-equipped computer laboratory with adequate desk top computers for students, including relevant computer software in each degree programme;
2. High speed Internet facilities for both staff and students;
3. A PC for each academic staff in his / her office with Internet facilities;
4. Multimedia Recording Devices (at least 2);
5. A Video recorder;
6. A video player;
7. A wide screen Television;
8. Overhead power-point, multi-media facilities;
9. Vehicle for field trips; and
10. Studio space

Animal Science Option

Laboratory Equipment

1. Photometers
2. Amino Acid Analyzer
3. Atomic Absorption Spectrophotometers
4. 50 Desktop Computers for teaching purposes
5. Incubator/Hatcher
6. Audio-Visual Aids
7. Centrifuges
8. Colorimeters
9. Spectrometers
10. Bench-top Incubators
11. Transfer chamber
12. Farm equipment (See Livestock Teaching & Research Farm)
13. 5 - 10 Microscopes (for large classes)
14. Weighing Balances as appropriate for the Department
15. Non-refrigerated Centrifuge (table-top) for 15 and 50ml conical
16. Refrigerated Centrifuge (table-top) for 15 and 50ml conicals
17. Moisture Meters
18. Water bath
19. Refrigerators
20. Ovens
21. Autoclave
22. Distillation Unit
23. Gas Chamber
24. Digestion Unit
25. Extraction Unit
26. Ashing Equipment (Furnace)
27. pH meters
28. Electronic calculator
29. Flame photometer
30. Deep freezers

Other equipment

Vehicles in a pool for the Department

1. Two (no) Lorries
2. Two (no) 4-wheel drive vans
3. Two (no) 50-seater buses
4. Two (no) station wagons
5. Two (no) tractors with complete accessories
6. One saloon car

Workshop

Workshop for training students in the maintenance of farm machine, equipment parts and other Engineering practicals must be provided on the University's Teaching/Research Farm in adequate numbers, based on the user space areas of about $15m^2$/FTE Student to accommodate machinery, equipment, and students.

Silos

Medium-sized silos are required not only to store grains produced from the Teaching/Research Farm but also to train students on the preservation of farm produce. The number of silos will depend on the level of operations in the farm.

Culture Rooms

Culture rooms would be needed for pathological work.

Teaching and Research Farm

A Teaching and Research Farm is mandatory for the practical acquisition of skills and knowledge by students, for staff research and solving practical problems. The Farm which should have the following units; (i) Poultry and other avian species such as ducks, Turkeys, Guinea fowl, quail, etc., (ii) Beef Cattle (iii) Dairy Cattle (iv) Pigs (v) Micro Livestock (Snails, Grass cutters) (vi) Small Ruminants (Sheep & Goats) (vii) Fishery (viii) Feed mills (ix) Draught power (Donkeys and Camels) should have the following facilities:

Pasture and Range Science

1. Pasture type Museum (2 hectares with a minimum of at least 10 different pastures).
2. Minimum of 50 hectares of pasture land.
3. Farm workshop.
4. On-Farm Processing and Storage Facilities.
5. Green house.
6. Screen house.
7. Sprayers.
8. Girth/Diameter Tapes.
9. Ranging Poles.
10. Dumpy Levels.
11. 2 – 3 Hectares of land mapped out for Soil Exercises.
12. 5 Augers.
13. 3 Munsel Colour Charts Kits.
14. 5 Soil Test Kits.

15. 2 Gunters Chains.
16. 1 Soil Map & Land Use Capability & Suitability Map.
17. G.I.S facilities.
18. Soil Analyzing Laboratory.
19. Ranging Poles.
20. Weather Station.
21. Theodolytes.
22. Compasses.
23. Tractors.
24. Trailers.
25. Ploughs.
26. Harrows.
27. Ridgers.
28. Bailers.
29. Sprayers.
30. Processing Equipment(Chopping and Cutting Machine for crop residues).
31. Irrigation Facilities

Animals

1. 2000 birds.
2. 10-sow unit.
3. 2 boars.
4. 50 cattle - 40 cows and 10 bulls.
5. 100 each of sheep and goats.
6. 500 rabbits

Livestock equipment

1. Metabolism cages (12).
2. Poultry cages.
3. Post-Mortem Kit.
4. Electric Beakers (4).
5. Weigh bridge (cattle).
6. Weigh bridge (pig).
7. Dip.
8. Drenching guns (4).
9. Motorised Sprayer.
10. Baler.
11. Quarantine.
12. Rabbit cages for 500 rabbits.
13. Holding Pens (Cattle, Sheep, Goat).
14. Basic Husbandry Equipment (Hoof Trimmer, castrator, Tagging machine, Dehorner, etc.)
15. Poultry processing equipment (Bleeding Cone, Scalding drum, Feather plucker, Hangers on wheel, Wash basins on wheel. Evisceration table, Meat cutting table, Bone saw, Vacuum packing machine, etc)
16. Ambulatory Box/First Aid Box

- **A Hatchery Complex.**

- **Cold Room**
- **Slaughter Slab**

Laboratories

To achieve the minimum academic standard statements for the Animal Science programme, there should be:

A minimum number of identifiable laboratories for each option in the Animal Science programme which should be in accordance with the NUC recommended space requirements and, in addition, be reasonably equipped. These laboratories include:

1. Nutrition and biotechnology.
2. Animal genetics, breeding and biotechnology.
3. Animal reproductive physiology.
4. Animal physiology and anatomy.
5. Livestock information technology.
6. Pasture science.
7. Bioclimatology.
8. Animal products.

At least one large and reasonably-equipped central laboratory for major teaching and research equipment.

Laboratory facilities and practical equipment required

1. Photometers
2. Amino Acid analyzer
3. Atomic absorption spectrophotometer
4. 20 desktop computers for teaching purposes
5. Electron microscope
6. Audio visual aids
7. Non-refrigerated centrifuges (tabletop) for 15 and 50 ml Conicals
8. Refrigerated Centrifuges (tabletop) for 15 and 50 ml Conicals
9. Colorimeters
10. Spectrometers
11. Bench-top incubators
12. Transfer chamber
13. Lamina flow chamber
14. Gas chromatography coupled with mass spectrometer (GCMS)
15. Gas chromatography coupled with electroantenogram
16. Leaf area meter
17. Plant samples grinding machine (with stainless metal)
18. Microscopes (for large classes)
19. Weighing balances as appropriate for the department
20. Moisture meters
21. Water baths
22. Deep freezers
23. Refrigerators
24. Desk top computers
25. pH-meter w/articulated arm

26. Fume cupboard
27. Test tube shaker
28. Light meter

Crop Science/ Soil Science Option

1. Ovens dryers
2. Autoclaves
3. Distillation units
4. Gas chamber
5. Digestion units
6. Extraction units
7. Ashing equipment (Furnace)
8. pH meters
9. Flame photometers

The following are considered very mandatory for the Crop Science Programme

1. Teaching and research farm;
2. Crop type museum (2 hectares with a minimum of at least 10 different crop types);
3. Minimum of 10 hectares of cropping land;
4. Farm workshop;
5. On-farm produce processing and storage facilities;
6. Green and Screen Houses;
7. Irrigation facilities; and
8. Silos **-** required to store grains produced from the teaching/research farm and for training students on the preservation of farm produce.

Minimum Standards for Equipment

1	pH meter (Table Top
2	Centrifuge
3	Colony counter
4	Digesting unit
5	Auto burrette
6	Auto pipette
7	Water bathe incubator
8	Sieve Shaker
9	Geographic information system units
10	Water distillers
11	Magnet stirrers
12	Soil augers
13	Infiltrometer

Staffing

Academic staff

The NUC guidelines on staff/students ratio of 1:15 for Departments in Agriculture discipline shall apply. However, there should be a minimum of six full-time equivalent of Staff in the Department. There is need to have a reasonable number of Staff with doctoral degrees as well as sufficient industrial/practical experience with a minimum load of 18 units per semester for students and a minimum of six full-time equivalent of staff in each programme. Staff should have a maximum of 15 contact hours per week for lectures, tutorials, practicals and supervision of projects.

In the Department, the academic staff number should be as per the National Universities Commission guidelines. The academic staff pyramid should be composed as follows:

1. Professor/Reader - 20%
2. Senior Lecturer - 35%
3. Lecturer 1 and below - 45%

Technical support personnel

The services of technical support staff, which are indispensable in the proper running of laboratories and workshops/studios, are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance. The minimum of academic staff to technical staff ratio of 5:1 should be maintained.

Adequate number of support staff should be available as

1. Administrative Officers
2. Secretaries
3. Laboratory Technologists
4. Workshop and Studio Technicians
5. Farm Officers
6. Farm Technicians
7. Produce Processors
8. Farm Equipment Maintenance Technicians

library

There must be adequate library facilities to cater for the needs of staff and students in all the programmes in the college/faculty. These include current journals, handbooks, textbooks, manuals, codes of practice, standards and specifications etc. in sufficient numbers. Most importantly, there shall be provision for ICT-based access to electronic resources and the information super highway.

Classrooms, Laboratories, Workshops and Offices

The NUC recommends the following physical space requirements:

		m^2
Professor's Office	-	18.50
Head of department's office	-	18.50
Tutorial teaching staff's office	-	13.50
Other teaching staff space	-	7.00
Technical staff space	-	7.00
Secretarial staff space	-	7.00
Academic staff research laboratory	-	16.50
Seminar space/per student	-	1.85
Laboratory space	-	7.50.

B.Sc. Agricultural Economics

Overview

This B. Agricultural Economics curriculum is a clear departure from the B. Agriculture programme with an option in Agricultural Economics where the curriculum does not allow students to offer a full complement of courses that makes them specialize fully in this subject area. This curriculum will help to produce graduates that understand clearly how to analyse and solve basic farm level problems using economic principles; contribute effectively to agribusiness decision making, undertake analysis of the agricultural policy space and diagnose causes of policy failures. It will enable the students understand the linkage between agriculture and other sectors of the economy and advise on how agriculture can contribute positively to economic growth. The curriculum has built in it, immense opportunity to engage the use of data to address so many economic problems.

This curriculum will therefore project the employability and job creation potentials of graduates trained with it. Ultimately, it will produce manpower that can contribute to the goals of the National Policy on Agriculture in Nigeria and can pursue further graduate studies in Agricultural Economics or related programmes globally.

Philosophy

The guiding philosophy of this programme is to help develop globally competitive skilled manpower in Agricultural Economics that will take the lead in the academia, research, policy formulation, and all sectors of the agriculture industry.

Objectives

The objectives of the Agricultural Economics programme will be to

1. train students that can apply economic principles to solve farm level and national food production problems;
2. provide appropriate knowledge and skills needed for intellectual development for research, agricultural related jobs and entrepreneurship in agribusiness;
3. equip students with knowledge to contribute towards formulating and strengthening of national agricultural policies to research outputs;
4. enable students acquire quantitative and analytical skills as well as attain versatility in the use of computer software packages to analyse and solve problems within the national and global agricultural and food production systems;
5. develop graduates armed with relevant knowledge and skills capable of undertaking further studies in Agricultural Economics and related fields; and
6. produce manpower than can serve as career Agricultural Officers; provide managerial and advisory services within the government and non-governmental sectors.

Employability skills

1. This curriculum will produce graduates who are critical thinkers and that are equipped with problem solving skills relevant in the work place.
2. The graduates will also have fully developed the skills to independently handle a research process and would be very relevant as a resource for research institutes, research units in

government and international agencies, consultants to agribusinesses and a ready resource for postgraduate studies in tertiary education institutions.
3. This curriculum will create lots of opportunities for collaborative tasks and will help graduates to work and communicate effectively in teams.
4. The curriculum will provide opportunities for several seminar presentations and report writing. This will help build students' confidence and enable them to properly report activities in work places.

21st Century skills

The programme will lead to the development and acquisition of the following 21st century skills:

1. Critical thinking,
2. Creativity
3. Collaboration
4. Communication
5. Information literacy
6. Media literacy
7. Technology literacy
8. Flexibility
9. Leadership
10. Initiative
11. Productivity
12. Social skills

Unique features of the programme

1. The discipline philosophy addresses the goal and objectives of the National Policy on Agriculture. This is broader in outlook than the curriculum in the Benchmark Minimum Academic Standards (BMAS) document and relates to all the stakeholders and sectors within agriculture in theory and practice. It addresses the priorities of agriculture at the local, national and global levels.
2. The objectives provide a specific and clear pathway to achieve the programme philosophy. The objectives are SMART; Specific, Measurable, Achievable, Realistic and Time bound.
3. The programme is rich in economic theory and will provide students with a deep theoretical and analytical capability to apply economic theory to the agriculture industry. It will prepare students effectively to pursue further career as Academics, Researchers, Agricultural Officers in governmental ministries and agencies, Entrepreneurs and Consultants.

Admission and Graduation Requirements

Admission Requirements

UTME – Four Year Degree Programme

In addition to UTME score, the candidate should possess five credit passes in Senior Secondary Certificate (SSC) to include English Language, Mathematics, Biology or Agricultural Science and any other two subjects from the following list: Chemistry, Physics or Geography and Economics in not more than two sittings.

Direct entry
Candidates must have at least 2 credit passes in Advance level or equivalents in Chemistry and Biology plus five SSC (or its equivalent) credit pass prescribed for UTME entry mode. Diploma Holders with a minimum of Upper Credit plus Five SSC (or its equivalent) credit pass Level at a maximum of two sittings are eligible for consideration for admission into 200- levels

Duration
The minimum duration for the programme is four (4) academic sessions (4-year duration) for candidates who enter through the UTME Mode. Direct Entry candidates admitted to the 200-level in Agriculture programmes will spend a minimum of three (3) academic sessions (3-year duration).

Graduation Requirements
To graduate, a student shall have undergone 3 or 4 years of study depending on his/ her entry point, including, SIWES and of practical training programme. The activities of the practical year should include periodic seminars on the student's work as a way of stimulating interest as well as the presentation of a written report to be graded at the end of the year.

Course workload must meet the graduation requirements. Candidates admitted through the UTME mode shall have registered for at least a minimum of 90 or 120 credit units for the 3-year (direct entry) and 4.year track, as indicated under course requirements. Candidates must also have registered and passed all the compulsory courses specified for the programme.
The submission of an undergraduate project report based on supervised research is another graduation requirement, which must not be compromised. This requirement exposes the student to problem-solving techniques and provides him/her with an ability to organize ideas from literature and research findings. It prepares the student for the work ahead and for further training at the postgraduate level. This area of academic preparation needs to be maintained and further developed.

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-

PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course code	Course title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	15	45
AGR 201	Principles of Crop Production	2	C	30	-
AGR 202	Introduction to Agricultural Economics	2	C	30	-
AGR 203	Introduction to Forestry and Wildlife Management	2	C	30	-
AGR 204	Introduction to Animal Production	2	C	30	-
AGR 205	Introduction to Fisheries and Aquaculture	2	C	30	-
AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
SOS 201	Principles of Soil Science	2	C	30	-
MWA 201	Agro-Meteorology, Biogeography & Climate Change	2	C	30	-
	Total	**20**			

300 Level

Course Code	Course Title	Units	Status	LH	PH
ENT 312	Venture Creation	2	C	30	-
GST 312	Peace and Conflict Resolution	2	C	30	-
AGE 301	Research and Statistical Methods	2	C	30	-
AGE 302	Introduction to Computer Application in Agricultural Economics	2	C	15	45
AGB 305	Farm Business Management & Production Economics	2	C	30	
AEC 307	Farm Management Accounting	2	C	30	2
AGB 313	Entrepreneurship and Agribusiness Development	2	C	30	2
AGB 303	Business Law	2	C	30	2
AEC 305	Economics of Climate Change	2	C	30	2
AGE 399	Practical Field Year Report	1	C	-	90
	Total	**19**			

400 Level

Course Code	Course Title	Units	Status	LH	PH
AEC 402	Microeconomic theory	2	C	30	-
AGB 402	Entrepreneurship and Agribusiness Development	2	C	30	-
AEC 403	Macroeconomic Theory	2	C	30	
AGE 401	Econometrics	2	C	30	45
AGE 402	Project Monitoring and Evaluation in Agriculture	2	C	30	
AGE 403	Agricultural Development and Policy	2	C	30	-
AGE 404	Agricultural Marketing and International Commodity Trade	2	C	45	-
AGE 405	Environmental and Natural Resource Economics	2	C	30	-
AGE 406	Seminar	2	C	-	90
AGE 499	Research Project	6	C	-	180
	Total Units	**20**			

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents
Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalization and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for

effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage, and development; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation.; Re-orientation Strategies: Operation Feed the Nation (OFN), Green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

AGG 102: Introduction to Agriculture I (2 Units C: LH 30)

Learning Outcome

At the end of these lectures, students should be able to:

5. have a broad understanding of the concepts and dimensions of agriculture in modern times with emphasis on Nigeria and the tropics;
6. acquire basic knowledge and understanding of the roles of agriculture and the place of soil, crop and animal resources in the production process as well as the constraints they face;
7. be familiar with the role of technologies in the transformation of agriculture; and
8. explain potentials and constraints to sustainable agricultural production

Course Content
Meaning and Scope of Agriculture.Importance of Agriculture to an expanded economy.Agricultural Ecology.Genetics, Agronomy.Rocks and Soil formation.Soil and Water Conservation.Soil Fertility. Land Preparation methods (soil tillage systems). Soil-water-plant relationship. Plant Forms and functions, Growth, Development and Reproduction. Plant Propagation Methods.Cropping Systems, Planting Patterns and Plant Densities.Crop Husbandry, Pasture and Forage Crops. Floriculture, Weeds, Crop Diseases, Crop Pests, Forest management (Silviculture), Crop Improvement, Animal Production, Forms and classification of major farm animals in West Africa, General terminology in animal production, Anatomy and physiology of farm animals, Reproduction in farm animals, Animal Nutrition, Livestock Management, Animal Health, Fisheries and Wildlife, Bee-keeping (Apiculture), Animal Improvement

AGG 112: Introduction to Agriculture II (1 Unit C: LH 15)

Learning Outcome
At the end of these lectures, students should be able to:
4. Explain the history of agricultural development and the role of the public and private sectors.
5. Identify and analyse the factors of agricultural production and the role of various resources
6. Explain constraints of technology and mechanization, and the role of agricultural extension transformation.

Course Contents
History of Agricultural Development in West Africa, Roles of Government and NGOs in Agricultural Development, Factors of agricultural production, Basic Economic Principles, Characteristic Features of Agricultural Production, Labour Management, Farm Management, Marketing of Agricultural Produce, Agricultural Extension, Agricultural Technology, Farm surveying and farmstead planning, Simple Farm Tools, Farm machinery and implements, Mechanization and sources of farm power, Processing and storage, Introduction to biotechnology, Application of ICT in agriculture, Introduction to agricultural research and statistics.

BIO 101: General Biology I (2 Units C: LH 30)

Learning Outcomes
At the end of lectures, students should be able to:
1. explain cell structure and organizations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents
Cell structure and organization, functions of cellular organelles, characteristics and classification of living things, chromosomes, genes and their relationships and importance, general reproduction, interrelationships of organisms (competitions, parasitism, predation, symbiosis,

commensalisms, mutualism, saprophytism); heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms), elements of ecology and types of habitats.

BIO 107: General Biology Practical I (1 Unit C: PH 45)

Learning Outcomes

At the end of the lectures, students should be able to:

1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents

Common laboratory hazards: prevention and first aid; measurements in biology; uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy, and proportion; use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101.**

CHM 101: General Chemistry I (2 Units C: LH 30)

Learning Outcomes

After studying all materials and resources presented in the course, the student should be able to:

1. define atom, molecules, and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionisation energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation–reduction equations and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridised orbitals;
7. identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure, and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy; and
10. determine rates of reactions and their dependence on concentration, time, and temperature.

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence, forces, structure of solids. Chemical

equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reactions, equilibrium, and thermodynamics. Acids, bases, and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II (2 Units C: LH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of transition metals.

Course Contents

Historical survey of the development and importance of organic chemistry; Fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanisms and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 108: General Chemistry Practical II (1 Units C: PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;
5. execute solubility tests on known and unknown organic compounds;
6. execute elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds

Course Contents

Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

MTH 101: Elementary Mathematics I (2 Units C: LH 30)
Algebra and Trigonometry)

Learning Outcomes
At the end of the course students should be able to:
1. understand basic definition of set, subset, union, intersection, complements and use of venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. understand various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents
Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition, and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Learning Outcomes
At the end of the course students should be able to:
1. understand types of rules in differentiation and integration;
2. understand the meaning of function of a real variable, graphs, limits, and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents
Function of a real variable, graphs, limits, and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; integration as an inverse of differentiation. Methods of integration, definite integrals. Application to areas and volumes.

200 Level

GST 212: Philosophy, Logic and Human Existence (2 Units C: LH 15; PH 45)

Learning Outcomes
A student who has successfully gone through this course should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge; and

8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents
Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents
Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

AGE 201: Principles of Crop Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. classify and measure production inputs and outputs;
2. construct basic production and cost curves and explain the relationship among the curves;
3. derive basic empirical production relationships and profit maximization determination conditions;
4. analyse pricing and output determination in the perfectly competitive market.
5. create the different farm records; and
6. use budgeting and linear programming for farm planning.

Course Contents

Economic principles underlying market exchange processes with particular reference to the theory of price mechanism in a market economy. Utility theory and the concept of indifference curves. The deviation of Engel's curves and household demand curves. The income and substitution effects of price change on normal and inferior goods. The nature of the demand for agricultural products. The principles of revealed preference and concept of index numbers as indicators of individual welfare changes. The deviation of farm- firm production functions. The nature of the demand and supply curves for agricultural inputs. Market equilibrium analysis under various market structures, specifically under perfect competition, monopoly, monopolistic competition, duopoly and oligopoly. The marginal productivity theory of distribution in perfectly competitive markets. Theories and principles of agricultural enterprises location, including comparative advantage and Von Thuner principles. Introduction to the theory of general equilibrium. The theory of welfare economics.

AGR 202: Introduction to Agricultural Economics (3 Units C: LH 45)

Learning Outcomes

At the end of the course students should be able to:

1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over;
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents

The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities.

Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology. Importance of rural communities and institutions, social stratification, social processes, and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

AGR 203: Introduction to Forestry and Wildlife Management (2 Units C:LH 30)

Learning Outcomes

The students will be able to:

1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and
5. raise seedlings of economic tree species.

Course Contents

Renewable natural resources, availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria. Silviculture, afforestation characteristics of major timbers and their uses. Forest production activities, forest protection and the regulation of harvest for sustained yield. Importance of forest in the national economy. Practical approach to apiculture, snailery, cane rat farming and other forest enterprises.

ANS 204 Introduction to Animal Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students are expected to have known the following:

1. prospects and problems of the animal industry;
2. identification/description of types of farm animals;
3. feeds and feeding management of farm animals;
4. housing and management systems of different livestock;
5. principles of animal health management;
6. animal breeding and breed improvement principles; and
7. basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc.).

Course Contents

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production, Feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and

rabbits). Introduction to game and companion animals; general principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation. Anatomy and physiology of the cell, tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses, and other systems of farm animals.

FAA 205: Introduction to Fisheries and Aquaculture (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students will be able to:

1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

Course Contents

Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological, economic, and cultural importance of fisheries park, zoo, sport fishing, marine park etc. Scope of fisheries and aquaculture.

AGR 206: Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: 30 LH)

Learning Outcomes

At the end of this course students should be able to:

1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;

7. identify the causes of food poisoning and the ways it could be prevented;
8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

Course Contents
Philosophy, scope, objectives and historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post- harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food; factors contributing to texture, colour, aroma, and flavour of food. Cost, traditional and ethnic influence of food preparation and consumption pattern.

SOS 207: Principles of Soil Science (2 Units C: LH 30)

Learning Outcomes
At the end of taking the Course, students should be able to know:
1. the role of the soil as a component of the environment;
2. the various disciplines of Soil and Job opportunities as Soil Scientists;
3. how soils are formed and the need to use the soil sustainably;
4. the various physical, chemical and biological activities taking place in the soil in order to prescribe appropriate management needs;
5. the need to survey, classify and map soil for various purposes;
6. the various challenges facing the soil under different situations; and,
7. relationship between climate change, soil management and utilization.

Course Contents
Soil as a natural Resource in the Environment; Sub-disciplines of Soil Science and employment opportunities; Soil Genesis/Formation and Development; Factors of Soil Formation. Soil Composition and Soil Ecosystem Functions; Soil Physical, Chemical and Biological properties (Texture, Structure, Density, Soil Solution, Soil Temperature, Soil Reaction, Salinity, Mineralization, Humification; Ammonification, Nitrification; Soil Organisms and Soil Organic Matter. Introductory Soil Survey, Classification and Mapping.Soil Fertility and Fertility Management; Soil Health. Soil Degradation (weathering, soil erosion, flooding, desertification and contamination); Climate Change and Soil Management.

WMA 201: Agro-Meteorology, Biogeography and Climate Change (2 Units C: LH 30; PH 45)

Learning Outcomes
At the end of the course, students are expected to know the following:
1. the meanings of agro-meteorology, biogeography and climate change ;

2. the relationship between agro-meteorology, biogeography, hydrology, and climate change;
3. basic elements and factors of climate; and climate change variation characteristics
4. relationship between climate and plants, as well as climate and soils;
5. understand basic principles of climate change adaptation and mitigation
6. adaptation in plants and animals.
7. understand biodiversity and ecosystem sustainability, including bio-resource conservation

Course Contents
Basic definitions and explanations in agro-meteorology and biogeography.The principles, aims and scope of agro-meteorology and biogeography.Relationships with agro-meteorology, biogeography and hydrology.Biodiversity and ecosystem sustainability.Principles of bio-resource conservation. Basic factors of climate formation, influence of relief on climate and plants. Geographical distribution of climatic elements, plants, and animals.Climate and soil.The concept of adaptation in plants and animals.Classification of climates and biogeography of the earth.The elements and control of climate and weather and the dynamics o the earth's atmosphere.Radiation and heating of the atmospheric systems, atmospheric moisture, and the dynamics of pressure and wind systems. Condensation and precipitation processes. The tropical climate, relation between agriculture and climate with reference to crop, livestock; irrigation, pest and diseases.Climate change and variation characteristics, impacts and adaptations, the importance of common short (e.g. august break, harmattan) and long seasons (dry and rainy seasons) on agriculture.

300 Level

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students, through case study and practical approaches, should be able to:
1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises;
7. conduct entrepreneurial marketing and e-commerce;
8. apply a wide variety of emerging technological solutions to entrepreneurship; and
9. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents
Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilized resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer

acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies).

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflict and violence;
3. differentiate between conflict and terrorism;
4. enumerate security and peace building strategies; and
5. describe roles of international organizations, media and traditional institutions in peace building

Course Contents

Concepts of peace, conflict, and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes, and rivalries. Economic inequalities, social disputes, nationalist movements, and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency, and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national, and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis

AGE 301: Research and Statistical Methods (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. Define a research problem and explain research process and steps;
2. Explain how to formulate research title and construction;
3. Give definition of variables, types of variables and measurement;
4. Develop hypothesis, and explain functions of hypothesis, research question, stating research objectives, Methods of data collection;
5. Explain methods of data collection;
6. Describe tools for data collection and construction of questionnaire;
7. Understand how to process and analyse data using quantitative and qualitative methods;
8. Construct simple and complex tables and graphs;
9. Understand the use of regression, correlation, t-test and chi-square techniques using computers;
10. Explain agricultural research and its importance to national development; and
11. Explain referencing techniques in research presentation.

Course Contents

Defining a research problem, Research process and steps,Formulation of title, construct, Definition of variables, types of variables and measurement; developing hypothesis, functions of hypothesis, research question, stating research objectives, Methods of data collection, Tools for data collection, Construction of questionnaire, Processing and analyzing data using quantitative and qualitative methods, Construction of simple and complex tables and graphs, use of Regression, correlation, t-test and chi-square techniques (using computers), Agricultural Research and its importance to national development, Referencing techniques in research presentation.

AGE 302: Introduction to Computer Application in Agricultural Economics (2 Units: CLH 15; PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. explain basic information technology terms;
2. use the computer and software packages to create databases; and
3. store information and analyse it using common software such as the Microsoft Excel and Access, SPSS, SAS, R statistics and E Views.

Course Contents

Information technology (IT) in information production, storage and retrieval. Information technology in communication, output generation and delivery. It and automation in agriculture. IT applications in agricultural production and marketing, consumption and product utilization.

AGB 305: Farm Business Management and Production Economics (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

5. technically organise factors of production;
6. mix factors of production appropriately for profit making;
7. understand the application of management techniques for optimal production; and
8. perform planning and budgeting of business enterprise to suit current realities.

Course Contents
The farm business environment. Nature and scope of farm business management and production economics. Production function estimation. Analysis production cost. Revenue concepts and their application in farm management decision making. Analysis of the basic Agricultural production relationships: factor- factor; factor- product; and product- Product Risk Management in farm businesses. Budgeting and linear programming in farm business planning and organization. Farm business analysis using income network and cash flow statements. Challenges of farm business organization and management in Nigeria.

AGB 303: Business Law (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
5. provide legal backing to the establishment of business enterprise;
6. apply legal decision in the running of the Agribusiness enterprise;
7. familiarise with the various legal sectors and their jurisdictions; and
8. understand the Conditions governing business transactions with individuals and corporate organisations.

Course Contents
The Nigerian legal system divisions and sources of Nigerian law common law and equity.Case law and precedent.Legislation including the nature and effects of Military Decrees, edicts and statutes.Interpretations.Customary law and Sharia law – meaning and scope. The court system: Outline of the structure and hierarchy of courts. Officers of the court.Qualifications of judges. Compositions and jurisdictions of various court summons. Outline of the nature of special tribunals. Forms of legal liability substance. Comparison and contrasts between criminal and civil ability. Defamation (i.e libel and slander). Negligent misstatements and passing off. Law of contract-nature and essential elements of a valid contract. Offer and acceptance: consideration formality, capacity, consent vitiating factors. Privity of contract, terms of contracts, discharge of contract, remedies for breach of contract, termination of contract, etc. Law of Agency-its creation and types.Rights and duties of principal and agents termination of agency.Sale of Goods-meaning and types of relevant goods. Conditions: warranties and caveat emptor doctrine, transfer of title and risks. The duties and rights of seller and buyer.Breach of the sale of goods contract and remedies.Law of Tort-Definition of Tort.Tort of Professional negligence, vicarious liability, criminal and civil liability.Hire purchase- its meaning and formation, the right and obligations of the parties.Contract of employment- the nature and formation of contracts of employment, rights and duties of employers and employees, termination and dismissal, and remedies for breach of employment contract, redundancy. Insurance contract- Its meaning, features and outline of concepts and principles; insurable interest, premium, indemnity and fixed sum insurance, subrogation and contribution. Assignment of policy, partnership;- Definitions, nature and types; general and limited partnerships; formation and articles of partnership, types, rights and duties of partners. Relationship of partners with each other and with third partners, dissolution of partnership.Banking and Negotiable instruments.The legal relationship of banker and customer and their mutual duties. The meaning and characteristics of negotiable instruments (Bill of Exchange, Cheques, promissory notes, etc.); Right and duties of the parties to a Bill of Exchange including the rights and duties of the holder in due course. Cheques and their crossing.Trust and Estate. Administration- Appointment, duties, powers,

rights and accounts of trustees, executors and administrators. Bankruptcy- Issue of receiving order.Appointment duties and powers of official receiver and trustee in bankruptcy.Statement of affairs and deficiency.

AGR 399: Practical Field Year Report (1 Units C:)

Learning Outcomes

At the end of the course, the students should be able to:

1. write a report of the practical semester activities and demonstrate the ability to present it; and
2. explain how to establish an agricultural enterprise.

Course Contents

Scientific writing and farm record practices. Submission of final report on Practical field Year Report.

Carry over courses should not be more than ten (10) credit units. Students are to proceed on SIWES for the **Second** 3 months in Second Semester of **300** Level.

400 Level

AGB 402: Entrepreneurship and Agribusiness Development (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

4. identify the nature and characteristics of business organisations;
5. compare and contrast Agribusiness forms of organisations and explain their advantages and disadvantages; and
6. develop a business idea worth of investing as an expert.

Course Contents

Nature and importance of Entrepreneurship in business and societal development. The Entrepreneur self-assessment test kit. Nature of agribusiness and its importance in Agricultural and economic development. Forms of Agribusiness organizations: sole proprietorship, Cooperative, Private Limited Liability Company, Public Limited Liability Company, etc. Prospective Agribusiness ideas worth investing in. Starting up and growing Agribusiness. Effective management of Agribusiness resources such as; finance, personnel, time, equipment, etc. in Agribusiness enterprises. Investment climate and its effect on Agribusiness in Nigeria.

AEC 402 : Microeconomic Theory (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. analyse household and firm decision-making processes;
2. use data to demonstrate the role of demand and supply forces in price determination and explain why markets are not efficient; and
3. estimate the profit maximization level of output for firms.

Course Contents
Scope of microeconomics. Concepts of trade-offs, opportunity cost, marginal utility theory. Household and firm decision making. Opportunity cost concept, demand and supply. Price determination and equilibrium markets. Firm level production and profit maximization. Perfect and imperfect competition and causes of market failure.

AEC 403: Macroeconomic Theory (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. explain the basic analytical concepts that are essential for understanding the global macro economy;
2. develop and apply economic models to real life situations; and
3. identify and explain the consequences of basic macroeconomic issues such as unemployment, inflation, stabilization policy, current account and debt, among others.

Course Contents
Scope of macroeconomics; Determination of national income accounts. The determinants of long run growth. General equilibrium. The monetary system. Inflation. Unemployment. The open economy; Business cycle fluctuations. The design and effectiveness of monetary and fiscal policy. Budget deficits and government debit.

AGE 401: Econometrics (2 Units C: LH 30)

Learning outcome
At the end of the course, the students should be able to:
1. develop econometric models from real life economic situations;
2. analyse different econometric models and correct the common estimation problems associated which such models; and
3. gain mastery of econometric packages for cross-sectional and time series analyses.

Course Contents
The nature, scope and objectives of econometrics. Review of statistical concepts. Simple correlation analysis. Simple linear regression analysis. Multiple linear regression analysis. Functional forms of regression models, problems in single equation models (heteroscedasticity, autocorrelation and multicollinearity). Special models in regression analysis (dummy variables, lagged variables, time as a trend variable). Introduction to simultaneous equation model and identification problem.

AGE 402: Project Monitoring and Evaluation in Agriculture (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. discuss the conceptual framework of agricultural projects;
2. design monitoring and evaluation plans for agricultural projects;
3. compare and rank projects using measures of project worth such as the Net Present Worth (NPW), Benefit Benefit-Cost (B/C) ratio, Net Present Worth (NPW);

4. assess the impacts of development projects; and
5. prepare feasibility report for an agricultural enterprise.

Course Contents
Conduct feasibility studies for small and large projects and submit a feasibility report on an agricultural enterprise of choice. Theory and practice of project appraisal at the local, regional and national levels. Estimating undiscounted and discounted measures of projects, evaluation and monitoring techniques. Provision of examples elucidating on the concepts of monitoring and evaluation as they apply to agriculture and rural development.

AGE 403: Agricultural Development and Policy (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. analyse the analytical basis for past agricultural policies and programmes of government;
2. discuss the policy formulation process, explain the theories and policies of agricultural development and their relevance to developing countries;
3. appraise the past and present agriculture sector policies in Nigeria;
4. analyse the impact of globalization on agricultural development in Nigeria; and
5. diagnose why government policies fail.

Course Contents
The concept of growth and development; major components of the development process. The changing roles of agriculture in the process of economic development. Sources of growth in agriculture with special reference to human skill, managerial ability, savings, investment, capital accumulation and technology. The content and significance of major models of economic development, especially the models of Lewis, Okhawa, Hayami and Ruttan; case studies of Japanese, Taiwanese and Israeli. Agricultural development in Nigeria. Analysis of government policies and programmes in relation to agricultural development in Nigeria.

AGE 404: Agricultural Marketing and International Commodity Trade (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. appraise the peculiarity of the rural marketing environment in terms of the consumer behavior, distribution channel and marketing strategies;
2. analyse marketing price and estimate market performance of the various players in the marketing chain;
3. analyse international commodity trade between Nigeria and other countries; and
4. critique the roles of different trade or multilateral trade institutions.

Course Contents
Nature and scope of agricultural marketing, nature of agricultural products and production, and their effects on marketing. Marketing functions, costs and margin. Marketing channels for major Nigerian agricultural products. Nature of competition in agricultural marketing. Cooperative marketing of agricultural products. Marketing efficiency, agricultural price policy in the context

of development including objectives of positive agricultural price policy and criteria for establishment price support schemes. Problems of agricultural marketing in Nigeria and the role of government in agricultural marketing pattern of distribution of agricultural products in Nigeria. Agricultural price analysis. Demand for agricultural products in Nigeria and its effect on farm income. Methods of estimating levels of food consumption. International trade in agricultural commodities. Strategic trade theory and application. Market power and the political economy of agricultural trade. Trade principles, institutions and policies. ECOWAS as a regional trading bloc. The GATT, EU- ACP trade relationship.

AGE 405: Environmental and Natural Resource Economics (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. discuss and apply the basic concepts of economics to environmental and natural resource issues;
2. apply the concept of sustainability to environment and natural resource use;
3. derive the conditions for static and dynamic efficiency and efficient natural resources allocation using graphical illustration and mathematical equations;
4. explain why the markets of environmental goods fail;
5. analyse the causes of and how to correct market failure; and
6. assess the role of public policies and institution in the management of natural resources.

Course Contents

Basic concepts and nature of natural resource and environmental economics. Trade-Offs and Efficiency. Economics and Morality. Concept of public good, Market Failures and externality. Sustainability issues: Stocks and Flows. Environment and Economic Growth and Development, International Trade and environment. Institutions and Policy Approaches to environmental economics. Pollution Policies. Types and characteristics of natural resources. Natural resources use and conservation problems with emphasis on policies and institutions affecting use and conservation. Theories and principles underlying the pattern of natural resources use; ownership control and use of rights as they affect public policies and plans for natural resources conservation. Land and Forest Policies as well as Policy Failures. Externalities and their control with reference to natural resources. Environmental and natural resource valuation. Case studies of environmental and natural resources problems.

AGE 406: Seminar (1 Units C: PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. search for literature, synthesize the literature, make observations and prescribe recommendations on topical issues; and
2. prepare seminar papers.

Course Contents

Research methods. Use of computer search engines to source for literature on online databases. Seminar presentation on special topics in the area of Agricultural economics and farm management.

AGE 499: Research Project **(4 Units C: PH 180)**

Learning Outcomes
At the end of the course, students should be able to:
1. identify an investigative research problem;
2. formulate a research problem and develop a research proposal;
3. carry out a field survey or source of secondary data, analyze the data using appropriate analytical tools and computer software; and
4. interpret the results and write a project report.

Course Contents
Formulation of problem statements and development of research objectives and hypothesis. Analytical research methods: descriptive, statistical/quantitative and judgmental; primary data collection; sources and collection of secondary data. Presentation of research findings in narrative, tabular and graphical forms. Report writing.

Minimum Academic Standards

Laboratory requirements
For agricultural economics training, the socioeconomic laboratory is a compulsory facility. The components of the laboratory for a class of 50 students are as follows:
1. Air conditioned computer laboratory with 55 computer tables and chairs;
2. 55units of computer systems;
3. 1 server unit
4. 5 printers
5. 1 unit of scanner
6. Broadband internet connection
7. Licensed copies of SPSS, STATA, e-view, R statistical packages
8. 2 units of projector
9. 2 units of projector screen
10. 2 units of white board
11. 60 sit capacity seminar room (60 Chair with arm rest)
12. Lecture delivery podium

Staffing

Academic staff
The NUC guidelines on staff/students ratio of 1:15 for Departments in Agriculture discipline shall apply. However, there should be a minimum of six full-time equivalent of Staff in the Department. There is need to have a reasonable number of Staff with doctoral degrees as well as sufficient industrial/practical experience with a minimum load of 18 units per semester for students and a minimum of six full-time equivalent of staff in each programme. Staff should have a maximum of 15 contact hours per week for lectures, tutorials, practicals and supervision of projects.

In the Department, the academic staff number should be as per the National Universities Commission guidelines. The academic staff pyramid should be composed as follows:
1. Professor/Reader - 20%

2. Senior Lecturer - 35%
3. Lecturer 1 and below - 45%

Technical support personnel

The services of technical support staff, which are indispensable in the proper running of laboratories and workshops/studios, are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance. The minimum of academic staff to technical staff ratio of 5:1 should be maintained.

Library

There must be adequate library facilities to cater for the needs of staff and students in all the programmes in the college/faculty. These include current journals, handbooks, textbooks, manuals, codes of practice, standards and specifications. in sufficient numbers. Most importantly, there shall be provision for ICT-based access to electronic resources and the information super highway.

Classrooms, Laboratories, Workshops and Offices

The NUC recommends the following physical space requirements:

		m^2
Professor's Office	-	18.50
Head of department's office	-	18.50
Tutorial teaching staff's office	-	13.50
Other teaching staff space	-	7.00
Technical staff space	-	7.00
Secretarial staff space	-	7.00
Academic staff research laboratory	-	16.50
Seminar space/per student	-	1.85
Laboratory space	-	7.50.

BSc. Agricultural Extension

Overview

These Core Curriculum and Minimum Academic Standards (CCMAS) are for a 4-Year B. Agricultural Extension, designed for the education and training of undergraduate students wishing to obtain first degrees in Agricultural Extension. Presented in this Section are the basic operational elements that serve to define the core curriculum aspects required to achieve the cardinal goal of producing graduates in the aforementioned programme, with sufficient academic background and practical exposure relevant to national and global development, especially in the face of the 4th industrial revolution in which Agriculture and the associated value chain are playing a key role.

It is imperative to state that the CCMAS for Agricultural Extension is expected to guide Nigerian Universities running the programme in the design of their respective curriculum, as it essentially prescribes the core curriculum and minimum academic standards expected of institutions in their renewed commitment to offer quality university education that would produce globally competitive Agricultural Extensionists. Universities are particularly encouraged to take due cognizance of the provisions of the CCMAS while bringing necessary innovation into the content and delivery of the programme, towards the attainment of the overall goals of the National education and training in the country.

Philosophy

The Philosophy underlying the B. Agricultural Extension programme is development of globally competitive manpower in agricultural extension and rural development as well as production of graduates that are adequately equipped with the comprehensive theoretical knowledge and practical skills required to teach farmers/agriculture practitioners the contemporary skills, methods and techniques required for meaningful engagement in agriculture and agriculture related fields, for self- reliance, national and global development.

Objectives

The objectives of the agricultural extension programme are in tandem with the national needs and priorities in the sector. Therefore, graduates of agricultural extension programme are expected to be resourceful, creative and knowledgeable, towards solving relevant societal problems. The specific objectives of the programme are to:

1. produce skilled manpower required to function productively and effectively as Agricultural Extension Agents in an agricultural sector characterized by rural settings with deficit knowledge in contemporary farming methods and techniques;
2. facilitate the actualization of the national quest for food self-sufficiency and production of agricultural raw materials needed for industrialization;
3. facilitate improvement in the quality of rural life through the delivery of quality agricultural extension education;
4. encourage the adaption and adoption of exogenous technology in order to solve local agricultural management problems; and
5. ensure that graduates exercise original thought, with sound professional judgment thus equipping them to offer quality services as consultants to farmers.

Employability skills

1. This curriculum will produce graduates who are critical thinkers and equipped with problem solving skills relevant in the work place.
2. The graduates will also have fully developed the skills to independently handle a research process and would be very relevant as a resource for research institutes, research units in government and international agencies.
3. This curriculum creates lots of opportunities for collaborative tasks and will help graduates to work and communicate effectively in teams.
4. Graduates would also be trained on how to be entrepreneurial in their profession as consultants.
5. They would also be employable in public and non-public (private and NGOs) extension organizations.

21st Century skills

The programme will lead to the development and acquisition of the following 21st century skills:

1. Critical thinking, problem solving, reasoning, analysis, interpretation, synthesizing information;
2. Research skills and practices, interrogative questioning Leadership, teamwork and collaboration;
3. Learning skills;
4. Literacy skills;
5. Oral and written Communication and public speaking;
6. Perseverance, self-direction, planning, self-discipline, adaptability, initiative; and
7. ICT literacy, media and internet literacy, computer programming.

Unique features of the programme

1. Development of blended learning of face to face and virtual learning in its delivery
2. Comprehensive approaches would be applied in teaching the students.
3. The importance of information and communication technology and other current extension platforms used globally in the delivery of extension services within the prevailing circumstance is emphasized.

Admission and graduation requirements

Admission requirements

In addition to UTME score, a candidate must have five credit passes in Senior Secondary Certificate (SSC) to include English Language, Mathematics, Biology or Agricultural Science and any other two subjects from the following list: Chemistry, Physics or Geography and Economics in not more than two sittings.

Direct entry mode

Candidates must have at least 2 credit passes in Advance level or its equivalents in Chemistry and Biology plus five SSC (or its equivalent) credit pass prescribed for UTME entry mode. Diploma Holders with a minimum of Upper Credit plus Five SSC (or its equivalent) credit pass at a maximum of two sittings are eligible for consideration for admission into 200 Level.

Minimum duration

The minimum duration for the programmes is Four academic sessions (4-year duration) for candidates who enter through the UTME Mode. Direct Entry candidates admitted to the 200-level will spend a minimum of 3 academic sessions (3-year duration).

Graduation requirements

To be eligible for graduation, a student must have satisfied:

1. The minimum credit units required is 120 units for UTME students and 90 units for Direct Entry(IJMB, ND and NCE) student;
2. the stipulated number of years for graduation;
3. must pass all core and required courses as indicated in this CCMAS; and
4. rerequisite courses shall be taken and passed before registration for a corresponding course at a higher level.

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course Code	Course Title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	15	45
AGE 202	Introduction to Agricultural Economics	2	C	30	-

SOS 207	Principles of Soil Science	2	C	30	-
AGX 204	Introduction to Agricultural Extension and Rural Sociology	2	C	30	-
AGX 205	Social Statistics and Research Methods in Extension	2	C	45	-
CPS 201	Principles of Crop Production	2	C	30	-
ANS 204	Introduction to Animal Production	2	C	30	-
AGX 206	Introduction to Computer Application in Agricultural Extension	2	C	15	45
FAA 205	Introduction to Fisheries and Aquaculture	2	C	30	-
FCS 202	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
FWM 203	Introduction to Forest Resources and Wildlife Management	2	C	30	-
	Total units	**22**			

300 Level

Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
GST 312	Peace and Conflict Resolution	2	C	15	45
ENT 312	Venture Creation	2	C	15	45
AGB 301	Agribusiness Value Chain Analysis	2	C	-	90
ANS 303	Entrepreneurship in Agriculture	2	C	15	45
AGX 305	Gender and Sustainable Agricultural Development	2	C	15	45
AGX 313	Multimedia Resource and Application in Agriculture	2			
AGX 301	Community Agricultural Extension	2	C	-	90
AGX 302	Planning of Supervised Enterprise Project (SEP)	2	C	-	90
AGX 303	Systems Thinking for Changing Agriculture	2	C	30	-
AGX 304	Extension and Community Development Practices	2	C	30	-
AGR 399	Field Practical Year Report	1	C	-	270
	Total units	**21**			

400 Level

Course Code	Course Title	Units	Status	LH	PH
AGE 404	Agricultural Development and Policy	2	C	30	-
AGX 401	Programme Planning and Evaluation	2	C	30	-
AGX 402	Extension Communication Systems and Methods	2	C	30	-
AGX 403	Teaching, Learning Methods in Agricultural Extension	2	C	30	-
AGR 404	Seminar	1	C	30	-
AGR 499	Special Project	6	C	-	180
	Total units	**15**			

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents
Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people, trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition, citizenship and civic responsibilities; indigenous languages, usage, and development, negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation.; Re-orientation Strategies: Operation Feed the Nation (OFN), Green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

AGG 102: Introduction to Agriculture I (2 Units C: LH 30)

Learning Outcome

At the end of these lectures, students should be able to:

9. have a broad understanding of the concepts and dimensions of agriculture in modern times with emphasis on Nigeria and the tropics;
10. acquire basic knowledge and understanding of the roles of agriculture and the place of soil, crop and animal resources in the production process as well as the constraints they face;
11. be familiar with the role of technologies in the transformation of agriculture; and
12. explain potentials and constraints to sustainable agricultural production

Course Content
Meaning and Scope of Agriculture. Importance of Agriculture to an expanded economy. Agricultural Ecology. Genetics, Agronomy. Rocks and Soil formation. Soil and Water Conservation. Soil Fertility. Land Preparation methods (soil tillage systems). Soil-water-plant relationship. Plant Forms and functions, Growth, Development and Reproduction. Plant Propagation Methods. Cropping Systems, Planting Patterns and Plant Densities. Crop Husbandry, Pasture and Forage Crops. Floriculture, Weeds, Crop Diseases, Crop Pests, Forest management (Silviculture), Crop Improvement, Animal Production, Forms and classification of major farm animals in West Africa, General terminology in animal production, Anatomy and physiology of farm animals, Reproduction in farm animals, Animal Nutrition, Livestock Management, Animal Health, Fisheries and Wildlife, Bee-keeping (Apiculture), Animal Improvement.

AGG 112: Introduction to Agriculture II (1 Unit C: LH 15)

Learning Outcome
At the end of these lectures, students should be able to:
7. Explain the history of agricultural development and the role of the public and private sectors.
8. Identify and analyse the factors of agricultural production and the role of various resources
9. Explain constraints of technology and mechanization, and the role of agricultural extension transformation.

Course Contents
History of Agricultural Development in West Africa, Roles of Government and NGOs in Agricultural Development, Factors of agricultural production, Basic Economic Principles, Characteristic Features of Agricultural Production, Labour Management, Farm Management, Marketing of Agricultural Produce, Agricultural Extension, Agricultural Technology, Farm surveying and farmstead planning, Simple Farm Tools, Farm machinery and implements, Mechanization and sources of farm power, Processing and storage, Introduction to biotechnology, Application of ICT in agriculture, Introduction to agricultural research and statistics

BIO 101: General Biology I (2 Units C: LH 45)

Learning Outcomes
At the end of the course, students should be able to:
1. explain cell structure and organizations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents
Cell structure and organization, functions of cellular organelles, characteristics and classification of living things, chromosomes, genes and their relationships and importance, general reproduction, interrelationships of organisms (competitions, parasitism, predation, symbiosis,

commensalisms, mutualism, saprophytism); heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms), elements of ecology and types of habitats.

BIO 107: General Biology Practical I (1 Unit C: PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents

Common laboratory hazards: prevention and first aid; measurements in biology; uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy, and proportion; use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered.

CHM 101: General Chemistry I (2 Units C: LH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. define atom, molecules, and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionisation energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation–reduction equations and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridised orbitals;
7. identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure, and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy; and
10. determine rates of reactions and their dependence on concentration, time, and temperature.

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence, forces, structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reactions, equilibrium, and thermodynamics.

Acids, bases, and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II (2 Units C: LH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of transition metals.

Course Contents

Historical survey of the development and importance of organic chemistry; Fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanisms and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. tell the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions

Course Contents

Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes
At the end of the course, students should be able to:
1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point; test on known and unknown organic compounds;
5. execute solubility tests on known and unknown organic compounds;
6. execute elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents
Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

MTH 101: Elementary Mathematics I (2 Units C: LH 30)
(Algebra and Trigonometry)

Learning Outcomes
At the end of the course, students should be able to:
1. appreciate basic definition of set, subset, union, intersection, complements and use of venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. identify various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents
Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition, and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. describe types of rules in differentiation and integration;
2. appreciate the meaning of function of a real variable, graphs, limits, and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents
Function of a real variable, graphs, limits, and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; integration as an inverse of differentiation. Methods of integration, definite integrals. Application to areas and volumes.

AGX 201: Introduction to Agricultural Extension and Rural Sociology (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. define and make valid comparison on agricultural extension methodologies world over;
2. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
3. appreciate the dynamics of leadership for social changes.

Course Contents
The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology. Importance of rural communities and institutions, social stratification, social processes, and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

200 Level

GST 212: Philosophy, Logic And Human Existence (2 Units C: LH 30)

Learning Outcomes
A student who has successfully gone through this course should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents
Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and

human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents

Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

AGR 202: Introduction to Agricultural Economics, Extension and Rural Sociology (3 Units; C) (LH 45)

Learning Outcomes

At the end of the course students should be able to:

1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over;

7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents

The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology. Importance of rural communities and institutions, social stratification, social processes, and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

SOS 207: Principles of Soil Science (2 Units C: LH 30)

Learning Outcomes

At the end of taking the Course, students should be able to identify:

1. the role of the soil as a component of the environment;
2. the various disciplines of Soil and Job opportunities as Soil Scientists;
3. how soils are formed and the need to use the soil sustainably;
4. the various physical, chemical and biological activities taking place in the soil in order to prescribe appropriate management needs;
5. the need to survey, classify and map soil for various purposes;
6. the various challenges facing the soil under different situations; and
7. relationship between climate change, soil management and utilization.

Course Contents

Soil as a natural Resource in the Environment; Sub-disciplines of Soil Science and employment opportunities; Soil Genesis/Formation and Development; Factors of Soil Formation. Soil Composition and Soil Ecosystem Functions; Soil Physical, Chemical and Biological properties (Texture, Structure, Density, Soil Solution, Soil Temperature, Soil Reaction, Salinity, Mineralization, Humification; Ammonification, Nitrification; Soil Organisms and Soil Organic Matter. Introductory Soil Survey, Classification and Mapping. Soil Fertility and Fertility Management; Soil Health. Soil Degradation (weathering, soil erosion, flooding, desertification and contamination); Climate Change and Soil Management

AGX 204: Introduction to Agricultural Extension and Rural Sociology (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. define rural sociology and make valid comparison with urban sociology on the basis of their special attributes;
2. define and comprehend the basic sociological terms as used in the field of sociology;
3. discuss the major rural social institutions, their functions and roles; and
4. describe leadership dynamics and other rural social processes and their roles in changing the lives of rural dwellers.

Course contents

Meaning, nature and scope of rural sociology. Organization of societies. Basic sociological concepts. Major social institutions. Analysis of the structure of rural agrarian systems and societies. Community characteristics of rural people. Social system. Components or characteristics of a social system. Social processes. Social stratification. Social mobility. Social change. Dimensions of social change and their potentials in the modernization of rural societies. Sources of social change in society. Socialization process. Social conflict and social control. Group dynamics. Internal group dynamics. External group dynamics. The social action processes. leadership patterns. Types of leadership. Implication of rural sociology for extension work.

AGX 205: Social Statistics and Research Methods in Extension (3 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. distinguish between data collection and analysis methods;
2. differentiate between qualitative and quantitative research methods; and
3. undertake research after graduation with minimal supervision.

Course Contents

Measurement. Sampling. Descriptive statistics. Bi-variate and multivariate statistics including non-parametric tests., Analysis of variance. Correlation and regression. Research methods and report writing. Measures of central tendency: mean (arithmetic and geometric), mode, median, quartiles and decile. Test of hypothesis Tabulation and presentation of statistical data with emphasis on histograms, graphs and frequency distributions.

CPS 201: Principles of Crop Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. define basic agronomic terminologies;
2. have knowledge of and basis of crop distribution across climatic regions;
3. have knowledge on crop grouping and distinct crop types;
4. have introductory knowledge of soil and its classification; and
5. have knowledge of soil management needs and some conservation practices.

Course Contents

Definitions of the terms, crops and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.). Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies.

Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.

ANS 204: Introduction to Animal Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should know the following:

1. prospects and problems of the animal industry;
2. identification/description of types of farm animals;
3. feeds and feeding management of farm animals;
4. housing and management systems of different livestock;
5. principles of animal health management;
6. animal breeding and breed improvement principles; and
7. basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc).

Course Contents

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production. Feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and rabbits). Introduction to game and companion animals; general principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation Anatomy and physiology of the cell, tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses, and other systems of farm animals.

AGX 206: Introduction to Computer Application in Agricultural Extension (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. use information and communication technologies in disseminating agricultural technologies to agribusiness owners;
2. apply various computer packages including Microsoft office, farm management softwares etc. ; and

3. use the internet for agricultural extension research.

Course Contents
The role of information and communication technologies on extension education. Using computer to develop files and databases relevant to agricultural extension. Theory and practice: Microsoft Word, Microsoft Excel, Microsoft PowerPoint. Internet basics and browsers. Agricultural extension data analysis software application. E-mail systems. Cloud computing and agricultural extension data management. Mobile technology and agricultural technology transfer. Social media and agricultural technology transfer. Information and communication technologies and diffusion of agricultural innovations.

FAA 204: Introduction to Fisheries and Aquaculture (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

Course Contents
Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological, economic, and cultural importance of fisheries park, zoo, sport fishing, marine park, etc. Scope of fisheries and aquaculture.

FCS 202: Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: LH 30)

Learning Outcomes
At the end of this course, students should be able to:
1. state the philosophy and objectives of family and consumer sciences;

2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;
8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

Course Contents

Philosophy, scope, objectives and historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme Approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post- harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food. Factors contributing to texture, colour, aroma, and flavour of food. Cos. Traditional and ethnic influence of food preparation and consumption pattern.

FWM 202: Introduction to Forest Resources & Wildlife Management (2 Units C: 15 LH; PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and
5. raise seedlings of economic tree species.

Course Contents

Renewable natural resources availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria. Silviculture. Afforestation. Characteristics of major timbers and their uses. Forest production activities. Forest protection. Regulation of harvests for sustained yield. Importance of forestry and wildlife to the national economy. Practical approach to apiculture. Snailery Cane rat farming and other forest enterprises.

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflicts and violence;
3. differentiate between conflict and terrorism; enumerate security and peace building strategies; and
4. describe roles of international organisations, media, and traditional institutions in peace building.

Course Contents

Concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts. Structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa. Indigene and settlers' phenomenon. Boundaries/boarder disputes. Political disputes, ethnic disputes and rivalries. Economic inequalities. Social disputes, nationalist movements and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes, etc. Peace building. Management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales. Constructive & destructive. Justice and legal framework. Concepts of social justice. The Nigeria legal system. Insurgency and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis. Refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis.

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises,conduct entrepreneurial marketing and e-commerce;
7. apply a wide variety of emerging technological solutions to entrepreneurship; and
8. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents
Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business. Leadership & management. Basic bookkeeping. Nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining. Traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR). Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies).

AGB 301: Agribusiness Value Chain Analysis (2 Units C PH 90)

Learning Outcomes
At the end of course, students, should be able to:
1. explain the essence of value addition to business enterprise;
2. verify the different methodological approach to value chain analysis of commodities;
3. identify the various stakeholders in the value chain;
4. estimate value added at each stage of chain; and
5. integrate commodities along the chain.

Course Contents
History of value chain. Concept of value chain analysis. Horizontal value chain analysis. Vertical value chain analysis. Methodology of value chain analysis. Analysis of value chain. Value chain development. Value addition. Value chain mapping. Value chain integration. Value addition estimation. Value chain strategies.

ANS 303: Entrepreneurship in Agriculture (2 Units C: LH 15; PH 30)

Learning Outcomes
At the end of this practical, hands-on course, the students are expected to have learnt:
1. the concept of entrepreneurship;
2. that animal production is a business enterprise;
3. how to add value to animal products;
4. how to draw up feasibility studies for livestock business enterprise;
5. how to access capital; and
6. book-keeping and records.

Course Contents
Introduction to entrepreneurship and new venture creation, Entrepreneurship in theory and practice, Animal production as a business. Forms of livestock businesses (livestock value chains). Feasibility studies; Determining capital requirements for livestock businesses (enterprises), staffing, marketing, etc. Financing livestock business using the CBN's interventions. Book-keeping and financial records.

AGX 301: Community Agricultural Extension (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. explain theories of community extension.
2. explain the value of group formation in community and apply collective approach to solving community problems;
3. collect field data and analyse; and
4. plan and execute development interventions in a community.

Course Contents
Theories of Community Development. Concept of community. Groups in community. Social change and agents of change. Use of participatory tools in problem identification and solution. Survey methods. Data collection/questionnaire administration. Use of interventions in community development

AGX 302: Planning of Supervised Enterprise Projects (SEPs) (2 Units C: LH 15; PH 15)

Learning Outcomes
At the end of the course, students should be able to:
1. explain the importance of assessing the basic needs of a community and the need for collective efforts in community projects; and
2. discuss the value of entrepreneurship and demonstrate some entrepreneurship skills.

Course Contents
Community needs assessment. Concepts in value addition and value chain. Community enterprises and self-employment issues. Principles of Action Research for solving community problems. Basic techniques in action research. This course will enable students to conduct their off-campus SEPs in their places of employment or other suitable locations. Projects must be relevant to the students' work environment and food and agro-processing. Students will implement off-campus SEPs after passing required courses and submission of acceptable proposals based on knowledge and skills acquired in this course.

AGX 303: Systems Thinking for Changing Agriculture (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. state the basic definitions of systems and system theory and their roles in extension delivery;
2. explain system thinking, principles and tools and how they are applied in extension work;

3. explain chaos theory and its implication in agricultural extension; and
4. assess the psychology of clients and know when and how to bring about the desired change.

Course Contents
Evolution of systems thinking as a field of study. Basic definitions of systems. Systems theory. System thinking. Systems principles. Systems tools. The systems thinking approach. Use of systems thinking. Systems thinking in organizations. Organizations as open systems. Five disciplines of systems thinking. Some applications of systems theory. Inquiry and advocacy. Chaos theory. Critical thinking. Basic assumptions underlying farmers' decisions, behaviours and attitudes. Psychology for extension personnel.

AGX 304 Extension and Community Development Practices (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. apply the concept of community participation in rural development;
2. explain how development projects are sustained and the sustainability elements; and
3. discuss the need for training of extension workers.

Course Contents
Concept of rural development. Concept of sustainable development. Agricultural extension and community development.Role of agricultural extension agents in providing the administration and organisation for rural development. Agricultural extension and community development programmes. Stakeholder participation in community development. Training needs of agents for agricultural extension and community development programmes.

AGX 305: Gender and Sustainable Agricultural Development (2 Units C: LH 30)

Learning Outcomes
At the end of this course, students should be able to:
1. explain the concepts of gender and sustainable agricultural development.
2. Identify the roles of gender in different aspects of sustainable agricultural development;
3. apply various computer packages including Microsoft office, farm management softwares etc.; and
4. make use of the internet agricultural extension research.

Course Contents
Concept of gender. Concept of sustainable agricultural development. Gender and access to agricultural inputs, finance. Gender and agricultural production and aquaculture. Gender and agricultural processing. Gender and agricultural marketing. Gender and food consumption. Gender and agricultural cooperatives. Gender and climate change and environmental management. Gender and migration. Gender and agricultural extension services. Gender and agricultural policy making.

AGX 313: Multimedia Resource and Application in Agriculture (2 Units C: LH 30)

Learning Outcome
At the end of this course, students should be able to:
1. explain concept of multimedia resources in agriculture; and
2. identify different types of multimedia resources and their relevance in agriculture through hands-on experiences.

Course Contents
Concept of multimedia resource. Types of multimedia resources. Appropriate multimedia for teaching and learning in agricultural extension. Development e-resources/contents for agricultural extension teaching and technology delivery. Hands-on experiences of different multimedia resources
Challenges and benefits of multimedia resources in agriculture

AGX 399: Students Industrial Work Experience (1 UNIT C: PH 45) (12 weeks)

Learning Outcomes
At the end of the course, students should be able to:
1. demonstrate practical farm experiences in the field;
2. differentiate between theory and practice; and
3. Provide solutions to most problems on-farm.

Course Contents
On the job experience in industry chosen for practical working experience but not necessarily limited to the student's major. Carry over courses should not be more than twelve (12) credit units. Students are to proceed on SIWES **First** 3 months in Second Semester of **200** Level.

400 Level

AGE 404: Agricultural Development and Policy (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. examine the basis for past agricultural policies and programmes of government;
2. discuss the policy formulation process, explain the theories and policies of agricultural development and their relevance to developing countries;
3. appraise the past and present agriculture sector policies in Nigeria;
4. analyse the impact of globalization on agricultural development in Nigeria; and
5. discuss why government policies fail.

Course Contents
The concept of growth and development. Major components of the development process. The changing roles of agriculture in the process of economic development. Sources of growth in agriculture with special reference to human skill, managerial ability, savings, investment, capital accumulation and technology. The content and significance of major models of economic development, especially the models of Lewis, Okhawa, Hayami and Ruttan. Case studies of

Japanese, Taiwanese and Israeli. Agricultural development in Nigeria. Analysis of government policies and programmes in relation to agricultural development in Nigeria.

AGX 401: Programme Planning and Evaluation (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. define administration in extension, monitoring and evaluation and their functions in extension work;
2. appreciate community participation in development projects; and
3. differentiate between monitoring and evaluation.

Course Contents
Planning process. Principle and concept of programme planning. Steps in planning. Concept of monitoring and evaluation. Importance of program planning in agricultural extension. . Clientele participation. Plan of work and calendar of work. Evaluation approaches. Logic models for programme evaluation. Corruption and its implication in agriculture and the economy.

AGX 402: Extension Communication Systems and Methods (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. apply the process of communication in extension work and evaluate alternative and current methods of communication; and
2. develop and use basic communication materials and tools.

Course Contents
Meaning and elements of communication process. Strategies in extension education and entertainment. Education for social change. Preparation and use of communication development models. Planning and developing information campaign. News gathering techniques. Mechanism and techniques for writing agricultural news for media, news evaluation and copy editing. Communication for innovation methods. Alternative extension methods. The concept of e-extension.

AGX 403: Teaching, Learning Methods in Agricultural Extension (2 Units C: LH 30)

Learning Outcomes
At the end of this course, students should be able to:
1. explain the concept of and Principles of Teaching and Learning in Agricultural Extension
2. understand Teaching-learning Methods in Agricultural Extension
3. demonstrate knowledge of the types of learning and the various methods of learning in Agricultural Extension, including their advantages and disadvantages
4. show understanding of the theories of learning in Agricultural Extension

Course Content
Teaching-learning methods in Agricultural Extension. Concepts of teaching and learning.
Principles of teaching and learning. Types of learning (Cognitive, Psychomotive and Affective learning). Various methods of learning. Factors affecting learning. Teaching methods

(Individual, Group and Mass). Disadvantages and Disadvantages of Teaching Methods. Audio-visulas techniques and extension teaching aids. Preparation and use of teaching aids. Learning Theories in Agricultural Extension.

AGX 404: Seminar (1 Unit C: LH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. select suitable researchable topics of study;
2. source for and analyse related literatures in selected areas of the chosen topics;
3. develop and demonstrate proficiency in writing and verbal skills; and
4. Produce a scientific report.

Course Contents

Literature search, proposal writing and presentation, presentation of pre-field and post-field seminars of students research project.

Students are expected to write a research proposal in the light of identified problem(s) in the agricultural extension sector. The research proposal is expected to cover the introduction, statement of problem, research objective, research question, hypothesis (if any), Significance of the study. Literature review. Methodology- which should include the statistical and econometric tools of analysis. Research proposal will be presented by the student individually (or in groups) using appropriate communication and presentation aids. Hard copy of the research will be produced by the student.

AGX 499: Project (6 Units C: PH 270)

Learning Outcomes

At the end of the course, students should be able to:

1. identify an investigative research problem;
2. formulate a research problem and develop a research proposal;
3. employ data collection instruments, measures, processes to solve the identified agricultural extension problem
4. carry out a field survey or source of secondary data, analyze the data using appropriate analytical tools and computer software; and
5. interpret the results and write a project report.

Course Contents

Each student is expected to carry out a special research project on topical problem under supervision supervisor in the two semesters of the final year. The research should be of a problem solving nature. The goal is to develop in the students, the ability to identify problems and to take informed decisions.

Minimum Academic Standards

Staffing

Academic Staff

The NUC guidelines on staff/student ratio for disciplines in Agriculture is 1: 15. However, there should be a minimum of six full-time equivalent of Staff in each programme. There is need to have a reasonable number of Staff with PhD, as well as with sufficient industrial/practical experience. With a minimum credit load of 15 Units per semester and maximum of 24 credit load for students, consideration should be given for a minimum of six full-time equivalent of staff in each programme. Staff should have a maximum of 15 contact hours per week for lectures, tutorials, practicals and supervision of projects.

The academic staff number should be as per the National Universities Commission guidelines with the ratio of 4: 1 to non-academic staff generally. The academic staff pyramid should be composed as follows:

i. Professor/Reader - 20%
ii. Senior Lecturer - 35%
iii. Lecturer 1 and below - 45%

Academic support personnel

Teaching Assistant/Demonstrators are recommended to assist lecturers in the conduct of tutorials, practicals and fieldwork.

Administrative support personnel

The services of the administrative support staff are indispensable for the proper administration of the departments and faculty offices. These will normally include confidential secretaries, clerical officers, Computer operators, messengers and cleaners.

Technical support personnel

The technical support personnel shall consist of technical officers and technologists. It is important to recruit very competent senior technical staff to maintain teaching and research equipment at a ratio of 5: 1 for teaching staff to technical support staff.

Library

Universities should leverage on available technology to put in place rich databases and other electronic/digital library and information resources. In addition, good stock of current hard copies of reference and other textual materials should be provided centrally at the level of the faculty. It is expected that Agricultural Extension programme should have at least 6 current books on various aspects of a programme in the Main Library of the University. A well-networked digital library should serve the entire university community. Availability of wireless facilities (such as, Wi-Fi) with adequate bandwidth should enhance access to these electronic resources.

Classroom accommodation and teaching support facilities

The NUC standard space requirement of 0.65m^2 per full-time student should be maintained. Thus, the minimum total space requirement of a Faculty or Department shall be the product of

its total full time equivalent student enrolment (FTE) and the minimum space requirement per full-time equivalent i.e. (FTE) 0.65m².
The total space requirement shall be met by a combination of classrooms and lecture theatres of varied capacities. These should however include the following:

i. A lecture theatre, equipped with a public address system, capable of accommodating at least 250 students or at least ¼ of all FTE in the Faculty, whichever is higher
ii. At least two large classrooms, with a public address system, capable of accommodating from 100 – 150 students
iii. One computer room capable of accommodating at least 50% of total students' population at any given time as well as adequate number of internet ready personal computers, word processors; and
iv. Each classroom should be furnished with comfortable chairs and desks befitting of a university. The classroom should be equipped with smart boards and multimedia facilities.

Office Accommodation

Each academic staff should have an office space of at least 25 square metres taking into cognizant the status/cadre of the staff. In addition, there should be for the Faculty, a Dean's office and for each department, a Head of Department's office. The Dean, HODs and Professors' Offices should be ensuite (ie. having toilet facilities), with attached offices for their supporting staff as specified below:

Classrooms, Laboratories, Clinics, Workshops and Offices Spaces

The NUC recommends the following physical space requirements

		m^2
Professor's office	-	18.50
Head of Department's office	-	18.50
Tutorial teaching staff's office	-	13.50
Other teaching staff space	-	7.00
Technical staff space	-	7.00
Secretarial staff space	-	7.00
Academic staff research laboratory	-	16.50
Seminar space/per student	-	1.85
Laboratory space	-	7.50

Staff-Student common room

In order to promote both social and academic interaction among staff and between staff and students, there should be a common room of about 35m² at the Faculty level, equipped with a kitchenette where staff and students could interact in an informal atmosphere.

Workshop/Studio/Laboratory

Each Faculty/programme should be provided with requisite laboratories, studios and workshops with relevant equipment in relation to student population and variety of activities performed in each programme. To achieve the minimum standards for any programme, there should be:

1. Well-equipped computer laboratory with adequate desk top computers for students, including relevant computer software in each degree programme;
2. High speed Internet facilities for both staff and students;
3. A PC for each academic staff in his / her office with Internet facilities;

4. Multimedia Recording Devices (at least 2);
5. A Video recorder;
6. A Video player;
7. A wide screen Television;
8. Overhead power-point, multi-media facilities;
9. Vehicle for field trips; and
10. Studio space

B.Sc. Animal Science

Overview

Animal science is the study of animals that live alongside humans and is concerned with the science and business of producing domestic livestock species, including but not limited to beef and dairy cattle, horses, poultry, sheep, goats, swine, rabbits, etc. In addition, animal science is concerned with aspects of companion animals, including their nutrition, care, and welfare. It requires formal training in, and knowledge of, the complex principles involved in animal production, care, and use; and training in the subject matter of animal behaviour and management, genetics, nutrition, physiology, reproduction, and meat science. A broad knowledge base in Animal Science prepares students for rewarding careers.

This curriculum contains two segments; the Core Curriculum (CC) segment, which specifies the core and compulsory courses with their learning outcomes and contents at the various levels, for all students seeking to be graduates of Animal Science and the Minimum Academic Standards (MAS) segment, which itemises minimum equipment, physical facilities and personnel required for training the 21st Century animal scientist.

Philosophy

The philosophy that guides the training of students in Animal Science seeks to adopt practical and realistic approaches to produce skilled manpower that is adequately furnished with comprehensive information on the biology of animal and livestock genetic resources as well as technologies required to manipulate the biological systems of these animals to increase their yield and productivity. It is intended to produce graduates with sufficient technical, productive and entrepreneurial skills in the business of animal agriculture, management of livestock farms and related enterprises and sufficient research inclination to be able to take up careers in academic fields as well.

Objectives

The objectives of the Animal Science programme are to:

1. produce graduates that are knowledgeable on all aspects of Animal Science including Animal breeding and genetics, Animal physiology, Animal behaviour and handling, Animal Nutrition and Biochemistry, General husbandry practices for all species of farm animals, Animal health care management and Animal products and by-product technology.
2. produce appropriate manpower equipped with necessary skills to establish and profitably operate animal and livestock enterprises.
3. contribute to the production of animal-based raw materials for industrial development.
4. produce graduates with the right technical and entrepreneurial skills and capacity necessary to appropriate their scientific know-how for the development of practical solutions and the advancement of the animal and livestock sub-sector.
5. process livestock into useful products so as to incorporate all value chains related to livestock production.
6. produce graduates that can create appropriate technologies that will be demand-driven in response to local needs and resolve ecological challenges for increased and sustainable animal agriculture and livestock productivity.
7. inculcate in the graduates, the knowledge of animal waste management and wealth creation from animal waste resources.

Unique features of the programme

1. The programme is designed to address the knowledge gaps created by recent advances in technological innovations in animal agriculture which have accelerated in the last 20 years. This is clearly lacking in the BMAS.
2. It also addresses the issue of knowledge, care and management of work and companion animals in line with current global trends.
3. The curriculum is designed to prepare the graduates to face the complex challenges of the present and future animal production by being able to identify opportunities and devise innovative solutions.
4. It also targets the production of graduates, who will not be job seekers but be self-employed or employers of labour as a result of the entrepreneurial skills acquired.
5. The fourth year of the programme is devoted to practical training on animal farms and related enterprises to equip the graduates with needed skills for practical animal production and science.

Employability skills

Graduates of Animal Science will have the following skills that will enable them to be meaningfully engaged:

1. **Independence**—the ability to perform research with minimum supervision, developing their own research methods and forming their own conclusions.
2. **Verbal and written communication skills**—the ability to communicate research findings in reports, publications, and courses.
3. **Active listening and interpersonal skills**—the ability to collaborate and communicate with other team members, as well as those in academia.
4. **Time management**—the ability to adhere to schedules, sometimes under stringent deadlines.
5. **Problem-solving skills** – the ability to understand a problem by breaking it down into smaller parts, and identifying the key issues, implications and identifying solutions.
6. **Organisational skills** - being organised and methodical. The ability to plan work to meet deadlines and targets.
7. **Ability to learn and adapt** - to be enthusiastic about work, and to identify ways to learn from mistakes for the benefit of both employee and employer.
8. **Self-motivation** – take pride in personal achievements and ability to bounce back from failures.

21st Century skills

The programme will lead to the development and acquisition of the following 21st century skills in the graduates:

1. Curiosity.
2. Critical thinking.
3. Creativity.
4. Collaboration.
5. Team work.
6. Digital literacy.
7. Information literacy.
8. Communication.
9. Media literacy.

10. Flexibility.
11. Leadership.
12. Initiative.
13. Social skills.

Admission and Graduation Requirements

Admission Requirements

Candidates are admitted into the Animal Science degree programme in any of the following two ways:

1. The Unified Tertiary Matriculation Examination (UTME)
2. Direct entry

UTME – Four-Year Degree Programme

In addition to UTME score, the candidate should possess five credit passes in Senior Secondary Certificate (SSC) to include English Language, Mathematics, Biology or Agricultural Science, Chemistry and Physics in not more than two sittings.

Direct entry mode

Candidates must have at least 2 credit passes in Advance level or equivalents in Chemistry and Biology plus Five SSC (or its equivalent) credit pass prescribed for UTME entry mode. Diploma Holders with a minimum of Lower Credit plus Five SSC (or its equivalent) credit pass Level at a maximum of two sittings are eligible for consideration for admission into 200 Level.

Minimum duration

The minimum duration for B.Sc. Animal Science programme is 4 academic sessions (4-year duration) for candidates who enter through the UTME mode.
Direct Entry candidates admitted to the 200-level in B.Sc. Animal Science programme will spend a minimum of 3 academic sessions (3-year duration).

Graduation Requirements

To graduate, a student shall have undergone 3 or 4 years of study depending on his/ her entry point. Student should undergo periodic seminars on the student's work as a way of stimulating interest as well as the presentation of a written report to be graded at the end of the year.

Course workload must meet the graduation requirements. Candidates admitted through the UTME mode shall have registered for at least a minimum of 120 units of courses for the 4-year programme and 90 units for the 3-year (direct entry) programme in Animal Science as indicated under course requirements. Candidates must also have registered and passed all the compulsory and required courses specified for the programme.

The submission of an undergraduate project report based on supervised research is a graduation requirement, which must not be compromised. This requirement exposes the student to problem-solving techniques and provides him or her with an ability to organise ideas from literature and research findings. In short, it prepares the student for the work ahead and for further training at the postgraduate level. This area of academic preparation needs to be maintained and developed further.

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course Code	Course Title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	15	45
AGR 201	Principles of Crop Production	2	C	30	-
AGR 202	Introduction to Agricultural Economics, Extension and Rural Sociology	2	C	30	-
AGR 203	Introduction to Forest Resources and Wildlife Management	2	C	30	-
AGR 204	Introduction to Animal Production,	2	C	30	-
AGR 205	Introduction to Fisheries and Aquaculture	2	C	30	
AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
ANS 201	Introduction to Computer Applications in Animal Production	2	C	15	45
ANS 202	Introduction to Anatomy and Physiology of Farm Animals, Work/Draft and Companion Animals	2	C	30	-
Total units		**18**			

300 Level

Course Code	Course title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
ANS 302	Introduction to Animal Breeding, Genetics and Biotechnology	2	C	30	-
ANS 303	Principles of Animal Nutrition and Biochemistry	2	C	45	-
ANS 304	Non-Ruminant Animal Production	2	C	30	-
ANS 305	Ruminant Animal Production	2	C	30	-
ANS 306	Principles of Animal Health and Diseases	2	C	30	-
ANS 308	Livestock Statistics and Data Processing	2	C	30	-
ANS 309	Nigerian Feed and Feeding Stuffs	2	C	15	45
ANS 399	Field Practical Year Report	1	C	-	45
Total units		**17**			

400 Level

Course Code	Course title	Units	Status	LH	PH
ANS 402	Feed Production Technology and Entrepreneurship	2	C	-	90
ANS 403	Animal Products, Processing, Handling and Marketing	2	C	-	90
ANS 405	Animal Husbandry Techniques	2	C	-	90
ANS 406	Animal Breeding and genetics	2	C	-	90
ANS 407	Animal Experimentation and Research Techniques with Professional Ethics in Livestock Production Practices and Legislation	2	C	-	90
ANS 408	Reproductive Physiology and Artificial Insemination	2	C	15	45
ANS 409	Pasture and Range Production and Management	2	C	30	-
ANS 408	Reproductive Physiology and Artificial Insemination	2	C	15	45
ANS 499	Project Report	4	C	-	180
Total units		**20**			

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students will be able to:

1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes.;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. Demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents

Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents
Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people,; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition,; citizenship and civic responsibilities; indigenous languages, usage, and development,; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation.; Re-orientation Strategies: Operation Feed the Nation (OFN), Green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments

BIO 101: General Biology I (2 Units C: LH 30)

Learning Outcomes
At the end of lectures, students should be able to:
1. explain cell structure and organizations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution and
6. enumerate habitat types and their characteristics.

Course Contents
Cell structure and organization, functions of cellular organelles, characteristics and classification of living things, chromosomes, genes and their relationships and importance, general reproduction, interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism); heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms), elements of ecology and types of habitats.

BIO 107: General Biology Practical (1 Unit C: PH 45)

Learning Outcomes
At the end of the lectures, students should be able to:
1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents
Common laboratory hazards: prevention and first aid; measurements in biology; uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy, and proportion, use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101.**

CHM 101: General Chemistry I (2 Units C: LH 30)

Learning Outcomes
After studying all materials and resources presented in the course, the student will be able to:
1. define atom, molecules, and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. 4.justify the trends of atomic radii, ionisation energies, electronegativity of the elements based on their position in the periodic table;
5. 5.identify and balance oxidation–reduction equations and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridised orbitals;
7. identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure, and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy; and
10. determine rates of reactions and their dependence on concentration, time, and temperature.

Course Contents
Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence, forces, structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reactions, equilibrium, Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods and thermodynamics. Acids, bases, and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry Practical II (2 Units C: LH 30)

Learning Outcomes
At the end of this course, students will be able to:
1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;

5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements and
9. describe basic properties of transition metals.

Course Contents
Historical survey of the development and importance of organic chemistry; Fullerenes as fourth allotrope of carbon, uses as nano-tubules, nanostructures, nano-chemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanisms and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, students will be able to:
1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. 3.identify the basic glassware and equipment in the laboratory;
4. tell the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyze the data to arrive at scientific conclusions.

Course Contents
Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, students will be able to:
1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carryout the preliminary tests which includes ignition, boiling point, melting test on known and unknown organic compounds;
5. execute solubility tests on known and unknown organic samples;
6. execute elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents
Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis volumetric methods.

MTH 101: Elementary Mathematics I (Algebra and Trigonometry) (2 Units C: LH 30)

Learning Outcomes
At the end of the course students will be able to:
1. understand basic definition of set, subset, union, intersection, complements and use of venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. understand various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents
Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition, and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 units C: LH 30)

Learning Outcome
At the end of this course, students should be able to:
1. understand types of rules in differentiation and integration;
2. understand the meaning of function of a real variable, graphs, limits, and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents
Function of a real variable, graphs, limits, and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; integration as an inverse of differentiation. Methods of integration, definite integrals. Application to areas and volumes.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes
On completion, the student will be able to:
1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems based on the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;

7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents

Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton laws of motion (inertia frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes, and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits.

PHY 102: General Physics II (Electricity and Magnetism) (2 Units C LH 30)

Learning outcomes

On completion the students should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of AC voltages and currents in resistors, capacitors, and inductors.

Course Contents

Forces in nature; electrostatics, electric charge and its properties, methods of charging, Coulomb's law and superposition, electric field and potential, Gauss's law, capacitance, electric dipoles, energy in electric fields, conductors and insulators, current, voltage and resistance, Ohm's law and analysis of DC circuits. Magnetic fields; Lorentz force, Biot-Savart and Ampère's laws, magnetic dipoles, dielectrics, energy in magnetic fields, electromotive force, electromagnetic induction, self and mutual inductances, Faraday and Lenz's laws. Step up and step down transformers: Maxwell's equations, electromagnetic oscillations and waves, AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

PHY 107/108: General Physics Practical I & II (1 Units C: PH 45)

Learning Outcomes
On completion, the student will be able to:
1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors; and
4. plot and analyse graphs, draw conclusions from numerical and graphical analysis of data.

Course Contents
This introductory course emphasises quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

200 Level

GST 212 : Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes
A student who has successfully gone through this course should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically assess the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge; and,
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents
Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding. Concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes and rivalries. Economic inequalities, social disputes, nationalist movements and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf,

chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis.

ENT 211 Entrepreneurship and Innovation (2 units C: 15; PH 45)

Learning outcomes

At the end of this course, students should be able to:

1. explain the concepts and theories of entrepreneurship,intrapreneurship, opportunity seeking new value creation and risk taking
2. State the characteristics of an entrepreneur
3. analyse the importance of micro and small businesses in wealth creation, employment and financial independence
4. engage in entrepreneurial thinking
5. identify key elements in innovation
6. describe stages in enterprise formation, partnership and networking including business planning
7. describe contemporary entrepreneurial issues, in Nigeria, Africa, and the rest of the World; and
8. state the basic principles of e-commerce.

Course Contents

Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.s

AGR 201: Principles of Crop Production (2 Units C: LH 30)

Learning Outcomes

Students will be equipped with:

1. basic agronomic, forestry and wildlife terminologies
2. knowledge of and basis of crop distribution across climatic regions;
3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification;
5. knowledge of soil management needs and some conservation practices.

Course Contents

Definitions of the terms, crops and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.). Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies. Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.

AGR 202: Introduction to Agricultural Economics, Extension and Rural Sociology (2 Units C: LH 30)

Learning Outcomes

At the end of the course students will be able to:

1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over;
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents

The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure,

investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology. Importance of rural communities and institutions, social stratification, social processes, and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

AGR 203: Introduction to Forest Resources & Wildlife Management (2 Units C: LH 15; PH 45)

Learning Outcomes

The students will be able to:

1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and
5. raise seedlings of economic tree species.

Course Contents

Renewable natural resources availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria. Silviculture, afforestation characteristics of major timbers and their uses. Forest production activities. Forest protection. Regulation of harvests for sustained yield. Importance of forestry and wildlife to the national economy. Practical approach to apiculture, snailery, cane rat farming and other forest enterprises.

AGR 204 Introduction to Animal Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students are expected to have known the following:

1. prospects and problems of the animal industry
2. identification/description of types of farm animals
3. feeds and feeding management of farm animals
4. housing and management systems of different livestock
5. principles of animal health management
6. animal breeding and breed improvement principles; and
7. basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc).

Course Contents

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production, feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and

rabbits). Introduction to game and companion animals; general principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation Anatomy and physiology of the cell, tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses, and other systems of farm animals.

AGR 205: Introduction to Fisheries and Aquaculture (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students will be able to:

1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

Course Contents

Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological, economic, and cultural importance of fisheries park, zoo, sport fishing, marine park, etc. Scope of fisheries and aquaculture.

AGR 206: Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: LH 30)

Learning Outcomes

At the end of this course students should be able to:

1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;

8. state the functions of food, and methods of food processing and preservation and
9. describe the composition and structures of Nigerian/West African food.

Course Contents
Philosophy, scope, objectives and historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post- harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food; factors contributing to texture, colour, aroma, and flavour of food. Cost, traditional and ethnic influence of food preparation and consumption pattern.

ANS 201 Introduction to Computer Applications in Animal Production (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, Students should be able to:
1. familiar with spreadsheet, data entry and data editing;
2. handle computer analytical procedure;
3. provide students with training in the use of software and electronic resources in the field of animal production;
4. perform some excel applications on animal production data;
5. use available ration formulation software; and
6. manage animal records.

Course Contents
The computer and its various components. Introduction to problem solving with computer application in animal production including ration formulation, animal breeding, management of animal records. Statistical analysis of data related to animal science. Summarization of data.

ANS 202 Introduction to Anatomy and Physiology of Farm Animals, Work/Draft and Companion Animals (2 Units C: LH 30)

Learning Outcomes
Students at the end of the course should able to:
1. identify the different parts of farm animals;
2. demonstrate the build-up of various parts of animal from the cell, tissue, organ, system and to the whole animal;
3. Demonstrate how the cells, tissues, organs, and systems differ and are related due to structure (Anatomy) and functions (physiology) of each and
4. appreciate the body balance and related activities performed within the animal body and how to distinguish between farm power animals and companion animals;
5. the roles of work and companion animals in providing benefits to man;
6. feeds and feeding of these animals and the disorders associated with them;

7. housing and Equipment applications (Kenneh, stalls, cages, zoos etc) for work and companion animals;
8. breeding management and propagation of work and companion animals;
9. the safe handling of these animals (safety from zoonosis and physical injuries) and legislation concerning companion animals.

Course Contents
General biology and management of pets in zoos, kennels and at home. Working safely with companion animals. Management of animals in kennels, shelters, research facilities and zoos. Regulatory issues of small animals used as companion pets and research. Feeding and feeding habits and patterns of horses, cats and dogs. Principles of nutrition in feeding horses, cats and dogs. Nutritional and metabolic diseases and their control and prevention through diets in horses, cats and dogs.

Parts of the beef and dairy cattle, sheep, goats, pigs, rabbits and poultry. Fundamentals of cell biology. Anatomy and physiology of the cell, cell types. Anatomy and physiology of animal tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses and other systems of farm animals. Physiological functions of animals; homeostatic, nutrition and digestion, respiration. Temperature regulation, excretion and reproduction. Endocrinology. The blood and circulation. Lactation, milk let down and egg production. Water balance.

300

GST 312 Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to
1. analyse the concept of peace, conflict and security
2. List major forms, types and root causes of conflicts and violence
3. Differentiate between conflict and terrorism, enumerate security peace building strategies and
4. Describe roles of international organization, media and traditional institutions in peace building.

Course Contents
Concept of peace, conflict and security in multi- ethnic., Types and theories of conflicts; ethnic, religious, and economic. Goe-political conflicts; structural conflicts theory, realist theory of conflict, frustration- aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settler's phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes and rivalries. Economic inequalities, social disputes, nationality movements and agitations. Selected case studies – Tiv-Junkun, Zango-Kartaf, chieftaincy and land disputes etc. Peace building, management of disputes and security. Peace and human development. Approaches to peace and conflict management….(religious, government, community leader etc). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales, constructive and destructive. Justice and legal framework, concepts of social justice. The Nigeria legal System. Insurgency and terrorism. Peace mediation and peace keeping. Peace

Security Council (international, national and locals levels). Agents of conflict resolutions conventions, treaties, community policing, evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration (c) negotiation (d) collaboration, etc. Roles of International Organizations in conflict resolution (a) The United Nations, UN and its conflicts resolution organs (B) The African Union & Peace Security Council (C) ECOWAS in peace keeping, Managing post-conflict situations/crisis refugees. Internally displaced persons, IDPs. The role of NGOs in post –conflict situation/crisis.

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. Describe the key steps in venture creation
2. Spot opportunities in problems and in high potential sectors regardless of geographical location;
3. State how original products, ideas and concepts are developed
4. Develop business concept for further incubation or pitching for funding
5. Identify key sources of entrepreneurial finances
6. Implements the requirements for establishing and managing micro and small enterprises; conduct entrepreneurial marketing and e-commerce
7. Apply a wide variety of emerging technological solutions to entrepreneurship; and
8. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (Sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs /market research, utilized resources, social and climate conditions and technology adoption gap) New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (Principles of marketing, customer acquisition and retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies). Small business management /family business; leadership and management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication(strategy)and tact of business negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market /customer solution, customer solution and emerging technologies, business applications of the new technologies – Artificial Intelligence (AI), Virtual mixed Reality (VR) Internet of Things (IoTs), Block chain, Cloud Computing, Renewable Energy, etc. Digital business and e-commerce strategies).

ANS 302: Introduction to Animal Breeding, Genetics and Biotechnology (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students are expected to have learnt/understood:

1. a brief history of genetics enunciating the contributions of Charles Darwin, Gregor

Mendel, E. H. Hackel. A. Weisman, W. Batesman etc.;
2. the chromosome compliments of common farn animals (cattle, sheep, goat, pig etc);
3. the helical nature of the DNA molecule and the base pairing system;
4. the role of the DNA and RNA in genetic coding;
5. monohybrid and Dihybrid inheritance using cross diagrams and the Punnet square;
6. how to distinguish between qualitative (descriptive) and quantitative (metric) traits;
7. the different gene actions (additive, dominance, epistasis etc.);
8. the different breeding systems (inbreeding, cross breeding, line breeding etc.), and
9. how to estimate heritability and repeatability of traits.
10. the difference between traditional biotechnology and modern biotechnol
11. artificial intervention of the natural animal through the use of biological systems, living organisms or parts to develop or create different products called genetic engineered organisms;
12. DNA, RNA and proteins and how they relate in function and form;
13. that new organisms will be produced through genetic engineering or biotechnology and the term "genetically modified organism" GMO; and
14. the rules regarding the use of GMO products, the safety precautions and laws guiding the use of such products which differs from one country to another with reasons.

Course Contents

History of genetics. Chromosomes structure, number and variations. Gene and genotype. Genetic code. Mendelism; fundamental principles of inheritance, quantitative and qualitative characters and their inheritance. Different types of gene actions, values and means, repeatability, heritability etc. Animal variation and selection principles. Breeding and environmental effects, in-breeding, pure line breeding, cross breeding and other breeding methods.

Meaning of Biotechnology, phases of biotechnology, scope and importance of biotechnology. Animal biotechnology; animal cell, tissue and organ culture. Nucleic acid and genetic information. The DNA; structure and technologies; transgenic animals as example of genetically modified organism (GMO). Rules and regulations in biotechnology, bio-safety, intellectual property rights.

ANS 303: Principles of Animal Nutrition and Biochemistry (2 Units C: LH 45)

Learning Outcomes

Students at the end of the course are expected to learn about the following:

1. chemical groups in animal body such as. fats, proteins, carbohydrates, minerals, vitamins, hormones, etc.;
2. chemical groups in feed, which are the same as those in the animal body;
3. pathways in nutrient metabolism in the animal body; glycolysis, TCA, gluconogensis;
4. digestion and absorption of the various nutrients;
5. symptoms of protein deficiency, mineral deficiency (specific and selected);
6. classifications of the various organic molecules in the animal body and their uses;
7. the mode of actions of the various molecules in the body;
8. differences between enzymes and hormone; classes of biological enzymes and their uses and
9. how the proximate components of agricultural products are determined in the laboratory.

Course Contents
Chemical composition of animal body in relation to their food. Nutrient types: energy, protein, lipids, fibre, minerals and vitamins. Nutrients for body maintenance and production – growth, pregnancy, lactation and egg production. Bio-energetics. Nutrient metabolism. Nutrient deficiency and symptoms. Basic Chemistry and metabolism of carbohydrates, lipids, proteins and nucleic acids, vitamins and their coenzyme functions. Chemistry and mode of action of enzymes and hormones. Chemistry and analysis of selected agricultural products. The nature, classification and function of enzyme and hormones. Bio-energetics. Creb cycle.

ANS 304: Non-Ruminant Animal Production (2 Units C: LH 30)

Learning Outcomes
At the end of this course students are should be able to:
1. explain clearly the production and management of poultry, swine and rabbits;
2. identify and discuss the attributes, problems and prospects of each species;
3. identify and describe of various enterprises (growing, fattening, hatching, breeder);
4. explain the management practices peculiar to each enterprise (Housing, health, breeding, and feeding) and
5. describe the processing and marketing of stock and products.

Coursse Contents
Poultry production: problems and prospects. Swine production: problems and prospects. Rabbit production enterprises: problems and prospects. Management systems of breeding stock; broilers, cockerels, ducks and turkeys. Hatchery enterprises and factors affecting hatchery operations. Housing, equipment and feeding principles of poultry, rabbits and pigs. Production and management practices. Livestock Economics. Health management of stock. Processing and marketing of poultry, pigs and rabbits.

ANS 305: Ruminant Animal Production (2 Units C: LH 30)
Learning Outcomes
Students are expected to acquire knowledge of:
1. attributes, problems and prospects of cattle, sheep and goats in Nigeria;
2. identification and description of the various enterprises (meat production, milk production, etc.); and
3. management practices peculiar to each species and enterprises in each in terms of;
4. housing and equipment needs;
5. feeds and feeding requirement;
6. health and health management;
7. reproduction management/regulation; and,
8. marketing and the economics of these enterprises.

Course Contents
Cattle production: Problems and prospects in Nigeria. Indigenous and exotic breeds of beef and dairy cattle. Dairy and beef production systems. Dairy and beef production enterprises. Sheep and goat production – breeds, management systems. Management of breeding stock, growing and young animal, Housing, equipment and feeding principles of cattle, sheep and goats. Health management of ruminant animals. Marketing of animals and their products.

ANS 306: Principles of Animal Health and Diseases (2 Units C: LH 30)

Learning Outcomes

On completion of the course, students should be able to:

1. identify organisms that cause diseases in livestock;
2. analyse symptoms of common livestock diseases, undertake diagnosis, , treatment and control;
3. explain life-cycles of disease causing organisms and principles of parasite control;
4. explain the immune system of livestock;
5. take care of sick animals;
6. carry out simple livestock management operations;
7. State the principles of public health;
8. discuss the significance of animal diseases; and
9. analyse details and consequences of common zoonotic diseases identify the various portals of disease entry into an animal farms;

Course Contents

Disease-causing organisms – bacteria, viruses, fungi, protozoa, etc. Symtoms, diagnosis, treatment and control of common livestock diseases. Life cycle of parasites. Principles of parasite control, immune system of the body. Care of sick animals – isolation, quarantine, and culling. Simple animal operations – castration, dehorning, drenching, drug administration. Public health significance of animal diseases and common zoonotic diseases.

Disease causative organisms. Symptoms, diagnosis, treatment and control of common livestock diseases. Ecto- and endo-parasites and their control measures. Nutritional diseases of monogastric and ruminant animals. Basic health management operations (identification aids, dehorning, debeaking, hoof trimming, dipping, castration and drug administration). Care of sick animals – isolation, quarantine and culling. Public health, significance of animal diseases and common zoonotic diseases.

ANS 308: Livestock Statistics and Data Processing (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, the students should be able to understand:

1. the following concepts; Population, Samples, Statistics, Parameters, Sampling, distribution, variations, measures of central tendency, etc;
2. field data collection, data sorting and data editing;
3. processing of data using statistical tools; and
4. data/results presentation of processed data using different statistic and graphics.

Course Contents

Basic concepts of statistics. Frequency distribution, measures of location, measures of variation. Probability distribution, normal and binomial distribution. Histograms, means, mode and median. Sampling, data collection, data processing techniques, statistical inference, tests of significance. F–Test, t-Tests, Chi-square. Analysis of variance, analysis of co-variance; correlation and regression analysis. Goodness of fit. Research objectives, Research design, field experimentation, collection and processing of data.

ANS 309: Nigerian Feed and Feeding Stuffs (2 Units C: LH 15; PH 45)

Learning Outcomes

1. That the students will be able to identify the different feed ingredients;
2. The students will be able to the chemical composition of the ingredients;
3. They will be able to know the nutritional contribution of each ingredient to the feed;
4. The student will be able to substitute one ingredient for another in and make for a balanced diet; and,
5. To know the role of each ingredient in the feed.

Course Content

Classification of foods, feeding stuffs and supplements, chemistry and nutritive values of succulent feeding stuffs; concentrate feeds, cereals, legumes and oil seeds, chemistry and nutritive values of some Nigerian grasses and legume species; storage and quality control of feeding stuffs and feeds

ANS 399: Field Practical Year Report (1 Units C: PH 45)

Learning Outcomes

At the end of this activity, the student should have learnt the following:

1. skills of technical writing;
2. logical presentation of facts and figure; and
3. skills of observation and reporting.

Course Contents

A report of all activities carried out during the practical year, including field visits and farm activities is required.

400 Level

ANS 402: Feed Production Technology and Entrepreneurship (2 Units C: PH 90)

Learning Outcomes

At the end of this practical, hands-on course, the student should have learnt how to:

1. formulate feeds (diets) for all classes of livestock;
2. handle, grind and mix different feeding stuffs in ration formulation;
3. identify various types, parts and kinds of feed mill equipment;
4. operate simple and complex feed milling equipment;
5. keep records in different sections of feed mill; and
6. package formulated feeds to prolong the shelf life of feeds.
7. the concept of entrepreneurship;
8. that animal production is a business enterprise;
9. how to add value to animal products?
10. how to draw up feasibility studies for livestock business enterprise;
11. how to access capital; book and record keeping
12. book-keeping and records.

Course Contents

The feed industry. Feed mixing and feed manufacturing on a large scale. Particle size reduction-bulk density-processing of grains and oil seeds. Processing of roughages. Diet development and processing; drying toasting enhancement through feed additives for coating and pelleting. Material handling, grinding, mixing, pelleting, crumbling, flaking, popping, extrusion and other operations. Introduction to pulverisers, pelletisers, complete feed block equipment. Plant layout and design of different capacity of feed mill. Exposure to practical feed preparation, Urea molasses, mineral blocks, premixes. Packaging and shelf-life of feeds.

Introduction to entrepreneurship and new venture creation, Entrepreneurship in theory and practice, Animal production as a business. Forms of livestock businesses (livestock value chains). Feasibility studies; Determining capital requirements for livestock businesses (enterprises), staffing, marketing, etc. Financing livestock business using the CBN's interventions. Book-keeping and financial records.

ANS 403: Animal Products, Processing, Handling and Marketing (2 Units C: PH 90)

Learning Outcomes

At the end of this practical, hands-on course, the students are expected to have learned the following:

1. pre-slaughter handling of different classes of farm animals;
2. dressing percentage of all various farm animals;
3. prime cuts;
4. packaging of dressed animal products;
5. marketing of animals and their products;
6. egg quality, handling, storage and grading;
7. how to identify quality meat;
8. methods of meat preservation;
9. meat inspection and grading;
10. processing of abattoir by-products;
11. production of blood meal, bone ash, feather meals; and
12. hides and skin processing such as flaying, curing and tanning.
13. handle meat animals prior to and after slaughter;
14. handle the carcass, offal and meat obtained after slaughter;
15. handle meat, milk and eggs in hygienic ways;
16. process meat, milk, and poultry products and
17. market these products.
18. Preparation for slaughtering, evisceration and dressing percentages. Care of carcass and its cuts, processing and care of hides, skin and wool. Processing, microbiology and storage of meat, milk and poultry products. Milk hygiene; effect of cooking on meat and milk flavour. Post-harvest physiology of animal products; egg quality and grading. Chemistry and nutritive value of meat and eggs. Milk by-products-butter, cheese and whey; preparation and storage of beef products – bacon, sausage and ham; food additives; flavours and aroma. Marketing and distribution of keep routine farm records such as purchases, mating/breeding records, production records, vaccination/herd health records, etc;

Course Contents
Pre-slaughter handling of different classes of farm animal. Slaughtering methods. Dressing and post-mortem changes in meat. Carcass cuts and measurement of carcass quality. Marketing of live animals and animal products. Visit to abattoirs. Processing of abattoir by-products: production of blood meal, bone ash, hooves, etc. Hides and skin processing. Visits to well established dairy farms. Milk processing and dairy microbiology.

ANS 405: Animal Husbandry Techniques and Livestock recording and identification (2 Units C: PH 90)

Learning Outcomes
At the end of this practical, hands-on course, the students should have learned the following:
1. routine practices in the husbandry of cattle, sheep, goats, poultry, pigs and rabbits;
2. management systems of cattle, sheep, goats, poultry, pigs and rabbits;
3. nutrient requirements, daily rations and feeding of cattle, sheep, goats, poultry, pigs and rabbits;
4. vaccination schedules and general health care of cattle, sheep, goats, poultry, pigs and rabbits;
5. common farm operations such as handling, control and grazing of ruminant animals;
6. keep routine farm record such purchases, mating/breeding record, production record, vaccination/herd health records etc;
7. identify each animal on the farm through naming, ear tagging, branding, tattooing, ear-notching;
8. use modern methods of animal identification such as microchip implants, radio wave frequencies, etc;
9. carry out contact tracing in disease surveillance; and,
10. easily identify sick animals for isolation and treatments

Course Contents
Production and management systems for cattle, sheep, goats, poultry, pigs and rabbits. Housing and space requirements. Ruminant animal feeding, Monogastric animal feeding. Regular routine management practices (daily, weekly, monthly, etc.) in cattle, sheep, goats, poultry, pigs and rabbit production; dehorning, castration, debeaking, vaccinations, disease surveillance. Common farm operations; handling and restrain techniques, grazing and herding. Animal identifications. Methods of animal identifications: naming, ear-tagging, skin branding, tattooing, ear-notching, electronic/digital. Routine farm records: farm purchases, mating/breeding records, production records, vaccination/herd health records. Identification of sick animals for isolation and regular treatment.

ANS 406: Animal Breeding and genetics (2 Units C: PH 90)

Learning outcome
At the end of the course, the students are expected to have known these:
1. the common metric character in farm animals;
2. continuous and discrete variables;
3. how the compute the measures of central tendency and dispersion in economic traits;
4. how to partition the phenotypic variation into the genetic and environmental components?;

5. how to estimate heritability and repeatability of economic traits, their genetic and phenotypic correlations;
6. common selection principles in animal science; and
7. breeding systems and the concept x environment interactions.

Course Contents
Characters of economic importance in farm animals. Statistical tools for studying inheritance. Partitioning phenotypic variance and covariance. Estimation of genetic parameters (heritability, repeatability, genetic correlations). Selection principles and methods. Breeding (mating) systems. Breeding plans for different farm animal species. Foundation stock development. Genotype by environment interaction.

ANS 407: Animal Experimentation and Research Techniques with Professional Ethics in Livestock Production Practices and Legislation (2 Units C: LH 30)

Learning Outcomes
At the end of this course, students will understand:
1. what an experiment is, the various steps taken to set up an experiment and formulate hypotheses;
2. how to conduct animal experiments in the different areas of Animal Science;
3. the basic statistical designs in animal experiment and when and how to deploy each;
4. how to collect and collate experimental data;
5. how to employ appropriate statistical tools for data analysis, interpretation and results presentation;
6. professional ethics of an Animal Scientist;
7. the Nigerian Institute of Animal Science (NIAS) Act;
8. practice regulations of the Nigerian Institute of Animal Science;
9. extant laws in the Nigerian livestock industry; and
10. regulatory issues on the use of companion animals

Course Contents
Planning of experiments. Research techniques in animal Science; Dairy Science research, physiological research, applied genetics, animal nutrition research i.e. germ free animals, Annulations, Colostomy. Research techniques in pasture. Basic statistical designs in animal science research: Completely randomized design (CRD), Randomized complete block design (RCBD), Hierarchical design, repeat design, Animal model, etc. Analysis, and interpretation of results.
Definition of livestock jurisprudence, profession ethics in animal science, production and practices. Laws in the Nigerian livestock industry. Meat laws in Nigeria, abattoir, dairy laws in Nigeria, regulatoru issues of small animals used as companion pets and research. NIAS Acts 26, 2007 and the amendment 2015.

ANS 408: Reproductive Physiology and Artificial Insemination (2 Units C: LH 15; PH 45)

Learning Outcomes
The students are to know the following at the end of the course:

1. reproduction and the involvement of mature male and female animals in the act of reproduction;
2. male and female reproductive organs of the major parts in reproduction;
3. male and female gametes to be viewed under microscope to appreciate their forms and functions for the foetus/embryo formation;
4. AI with its merits and demerits side by side with natural insemination in livestockproduction. The role of male and female animals in AI, embryo transfer etc.; and
5. management practices in terms of feeding and handling that improve and encourage reproduction among farm animals.

Course Contents

The reproductive systems in male and female animals; Physiology of sperm and ovum. Endocrinology; reproduction, Egg production, pregnancy and foetal development. Fertility and sterility of farm animals. Role of AI in livestock production. Cloning, embryo transfer. Management of male donors; semen collection, evaluation, preservation and storage. Artificial insemination techniques.

ANS 409: Pasture and Range Production and Management (2 Units C: LH 30)

Learning Outcomes

Students are expected to acquire knowledge of:

1. distinguish between pasture and forage;
2. know the common and botanical names of common indigenous and foreign pasture and forage species;
3. establish and maintain a pasture land;
4. establish a fodder bank; germplasm collection, preservation and storage; and
5. understand what range management is.

Course Contents

Adaptation and botany of indigenous and introduced pastures and forage plants. Characteristics of grasses, legumes and shrubs. Establishment, production and seed production of pasture plants; the utilization and maintenance in permanent and temporary pastures. Forage legumes and their roles in tropical farming system. Fodder bank technology; shrubs and trees legumes. Agronomic management for seed production. Seed harvesting, processing and storage. Germplasm collection, preservation and storage. Range Management; Grazing Systems; Forage conservation, dry season feeds. (2 hour of lectures and 1hour of practicals per week).

ANS 499: Project and Seminar (4 Units C: PH 180)

Each student is expected to choose and execute a special project under a supervisor. Duration of the project is 2 semesters.

Minimum Academic Standards

Laboratory Equipment

1. Photometers
2. Amino Acid Analyzer
3. Atomic Absorption Spectrophotometers
4. 50 Desktop Computers for teaching purposes
5. Incubator/Hatcher
6. Audio-Visual Aids
7. Centrifuges
8. Colorimeters
9. Spectrometers
10. Bench-top Incubators
11. Transfer chamber
12. Farm equipment (See Livestock Teaching & Research Farm)
13. 5 - 10 Microscopes (for large classes)
14. Weighing Balances as appropriate for the Department
15. Non-refrigerated Centrifuge (table-top) for 15 and 50ml conical
16. Refrigerated Centrifuge (table-top) for 15 and 50ml conicals
17. Moisture Meters
18. Water bath
19. Refrigerators
20. Ovens
21. Autoclave
22. Distillation Unit
23. Gas Chamber
24. Digestion Unit
25. Extraction Unit
26. Ashing Equipment (Furnace)
27. pH meters
28. Electronic calculator
29. Flame photometer
30. Deep freezers

Other equipment

Vehicles in a pool for the Department

1. Two (no) Lorries
2. Two (no) 4-wheel drive vans
3. Two (no) 50-seater buses
4. Two (no) station wagons
5. Two (no) tractors with complete accessories
6. One saloon car

Workshop

Workshop for training students in the maintenance of farm machine, equipment parts and other Engineering practicals must be provided on the University's Teaching/Research Farm in adequate numbers, based on the user space areas of about $15m^2$/FTE Student to accommodate machinery, equipment, and students.

Silos
Medium-sized silos are required not only to store grains produced from the Teaching/Research Farm but also to train students on the preservation of farm produce. The number of silos will depend on the level of operations in the farm.

Culture Rooms
Culture rooms would be needed for pathological work.

Teaching and Research Farm
A Teaching and Research Farm is mandatory for the practical acquisition of skills and knowledge by students, for staff research and solving practical problems. The Farm which should have the following units; (i) Poultry and other avian species such as ducks, Turkeys, Guinea fowl, quail, etc., (ii) Beef Cattle (iii) Dairy Cattle (iv) Pigs (v) Micro Livestock (Snails, Grass cutters) (vi) Small Ruminants (Sheep & Goats) (vii) Fishery (viii) Feed mills (ix) Draught power (Donkeys and Camels) should have the following facilities:

Pasture and Range Science
1. Pasture type Museum (2 hectares with a minimum of at least 10 different pastures).
2. Minimum of 50 hectares of pasture land.
3. Farm workshop.
4. On-Farm Processing and Storage Facilities.
5. Green house.
6. Screen house.
7. Sprayers.
8. Girth/Diameter Tapes.
9. Ranging Poles.
10. Dumpy Levels.
11. 2 – 3 Hectares of land mapped out for Soil Exercises.
12. 5 Augers.
13. 3 Munsel Colour Charts Kits.
14. 5 Soil Test Kits.
15. 2 Gunters Chains.
16. 1 Soil Map & Land Use Capability & Suitability Map.
17. G.I.S facilities.
18. Soil Analyzing Laboratory.
19. Ranging Poles.
20. Weather Station.
21. Theodolytes.
22. Compasses.
23. Tractors.
24. Trailers.
25. Ploughs.
26. Harrows.
27. Ridgers.
28. Bailers.
29. Sprayers.
30. Processing Equipment(Chopping and Cutting Machine for crop residues).

31. Irrigation Facilities

Animals

1. 2000 birds.
2. 10-sow unit.
3. 2 boars.
4. 50 cattle - 40 cows and 10 bulls.
5. 100 each of sheep and goats.
6. 500 rabbits

Livestock equipment

1. Metabolism cages (12).
2. Poultry cages.
3. Post-Mortem Kit.
4. Electric Beakers (4).
5. Weigh bridge (cattle).
6. Weigh bridge (pig).
7. Dip.
8. Drenching guns (4).
9. Motorised Sprayer.
10. Baler.
11. Quarantine.
12. Rabbit cages for 500 rabbits.
13. Holding Pens (Cattle, Sheep, Goat).
14. Basic Husbandry Equipment (Hoof Trimmer, castrator, Tagging machine, Dehorner, etc.)
15. Poultry processing equipment (Bleeding Cone, Scalding drum, Feather plucker, Hangers on wheel, Wash basins on wheel. Evisceration table, Meat cutting table, Bone saw, Vacuum packing machine, etc)
16. Ambulatory Box/First Aid Box

A Hatchery Complex.
Cold Room
Slaughter Slab

Staffing

Academic Staff

The NUC guidelines on staff/student ratio of 1:15 for Agriculture and related programmes shall apply. However, there should be a minimum of six full-time equivalent of staff in each department/option in Animal Science. There is need to have a reasonable number of staff with doctoral degrees as well as sufficient industrial/practical experience. With a minimum load of 15 Units per semester for students and a minimum of six full-time equivalents of staff in each Department/option, staff should have a maximum of 15 contact hours per week for lectures, tutorials, practicals and supervision of projects.

In each department/option in Animal Science, the academic staff number should be as per the National Universities Commission guidelines. The academic staff pyramid should be composed as follows:-

1. Professor/Reader - 20%

2. Senior Lecturer - 35%
3. Lecturer 1 and below - 45%

Academic Support Personnel
Teaching Assistant/Demonstrators are recommended to assist lecturers in the conduct of tutorials, practicals and field-work.

Administrative Support Personnel
The services of the administrative support staff are indispensable to the proper administration of the departments and faculty offices. These will normally include confidential secretaries, clerical officers, typists, messengers and cleaners.

Technical Support Personnel
The technical support personnel shall consist of technical officers and technologists. The services of technical support staff, which are indispensable in the proper running of laboratories and workshop are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance. The minimum of academic staff to technical staff ratio of 5:1 should be maintained.

library
There must be adequate library facilities to cater for the needs of staff and students in the Animal Science programme. These include current journals, handbooks, textbooks, manuals, codes of practice, standards and specifications etc. in sufficient numbers. Most importantly, there shall be provision for ICT-based access to electronic resources and the information super highway.

Classrooms, laboratories, workshops, studios, offices.

(a) Spaces
The NUC recommends the following physical space requirement:

		m^2
Professor's Office	-	18.50
Head of Department's Office	-	18.50
Tutorial Teaching Staff's Office	-	13.50
Other Teaching Staff Space	-	7.00
Technical Staff Space	-	7.00
Secretarial Space	-	7.00
Academic Staff Research Laboratory	-	16.50
Seminar Space/per student	-	1.85
Laboratory Space	-	7.50

Laboratories
To achieve the minimum academic standard statements for the Animal Science programme, there should be:
A minimum number of identifiable laboratories for each option in the Animal Science programme which should be in accordance with the NUC recommended space requirements and, in addition, be reasonably equipped. These laboratories include:

1. Nutrition and biotechnology.

2. Animal genetics, breeding and biotechnology.
3. Animal reproductive physiology.
4. Animal physiology and anatomy.
5. Livestock information technology.
6. Pasture science.
7. Bioclimatology.
8. Animal products.

At least one large and reasonably-equipped central laboratory for major teaching and research equipment.

B.Sc. Crop Science

Overview

The crop science programme curriculum is designed to impact knowledge in a broad sense in all aspects of crop science, production, produce preservation and utilization. It emphasizes a complete value chain in crop production. As much as possible, it teaches the deployment of modern technology in meeting the emerging challenges of food insecurity and grooming learners for the development of a sustainable enterprise in crop production.

An appropriate delivery of the contents of the course modules of the curriculum of this programme would produce not just, scientists but equally entrepreneurs in crop production, value addition to crop produce as well as packaging of final crop produce.

Philosophy

The principal focus of the national agriculture policy is to strengthen the component parts of the agricultural sector, with particular reference to the crop production sub-sector to meet the demand for food and industrial raw materials. Thus, the philosophy and mission statement underlying the crop science programme of agriculture, are aimed at achieving the goals and of positive and significant contribution to the nation's gross domestic product (GDP) and in furtherance of Nigeria's renewed commitment for food sufficiency and general self-reliance through the churning out of graduates that are adequately equipped with the comprehensive theoretical knowledge and practical skills required for meaningful engagement in crop agriculture.

Objectives

The objectives of the programmes in agriculture discipline are in tandem with the national needs and priorities in the sector. Therefore, graduates of the discipline are expected to be resourceful, creative, and knowledgeable, towards solving relevant societal problems.

The specific objectives of the crop science programme are to:

1. equip crop science graduates with adequate knowledge in the theory and practice of crop production for meeting the increasing demand for food and food security as well as self-sufficiency;
2. enhance the national industrialization drive through increased production of industrial raw materials needed for a diversified economy;
3. advance knowledge in modern production techniques, produce processing, and value addition through processing, storage/preservation and produce transit/distribution;
4. improve employability and employment opportunities, thus reducing the social ills resulting from unemployment;
5. apply contemporary technology relevant to improved crop production techniques as a means of up-scaling crop productivity per land area;
6. produce graduates that are confident of entering into practical enterprise in crop production related ventures; and
7. equip graduates with adequate scientific knowledge and background for effective research in crop science.

Employability skills

The curriculum for the programme takes due cognizance for employability, such that the graduates of crop science would have appreciable competence and skill in the following areas.

1. Production enterprise in arable crop farming.
2. Production enterprise in vegetable crop farming.
3. Production enterprise in orchard establishment and management.
4. Enterprise in seed production, processing, and packaging.
5. Consultancy in all crop production aspects.
6. Research in crop science and crop improvement.

21st Century skills

As an improvement over the old BMAS, emerging challenges in skill gap for the 21st century addressed by the new CCMAS in crop science include the following.

1. Critical thinking, problem solving, reasoning, analysis, interpretation, synthesizing information;
2. Research skills and practices, interrogative questioning Leadership, teamwork and collaboration;
3. Learning skills;
4. Literacy skills;
5. Oral and written Communication and public speaking;
6. Perseverance, self-direction, planning, self-discipline, adaptability, initiative; and
7. ICT literacy, media and internet literacy, computer programming.

Unique features of the programme

1. As an improvement on the current BMAS, the new crop science programme, the philosophy and objectives are in line with the goal and objectives of the national policy on agriculture, making trainees more relevant to national and global agricultural sector development.
2. The programme involves a broad training at the lower levels of study such that the graduate has basic knowledge of the overall agricultural discipline, additional to the advance crop science training at the latter years of study.
3. The practical focus is enterprise-based towards meeting the emerging challenges of food and industrial crop supply gap, thus contributing to food security.

Admission and graduation Requirements

Admission Requirements

Candidates are admitted into the degree programmes in any of the following two ways.

1. The Unified Tertiary Matriculation Examination (UTME)
2. Direct Entry

UTME – Four Year Degree Programme
In addition to UTME score, the candidate should possess five credit passes in Senior Secondary Certificate (SSC) to include English Language, Mathematics, Biology or Agricultural Science, Chemistry and Physics in not more than two sittings.

Direct entry mode
Candidates must have at least 2 credit passes in Advance level or its equivalents in Chemistry and Biology plus Five SSC (or its equivalent) credit pass prescribed for UTME entry mode. Diploma Holders with a minimum of Lower Credit plus Five SSC (or its equivalent) credit pass Level at a maximum of two sittings are eligible for consideration for admission into 200-levels.

Duration
The minimum duration for the programmes is 4 academic sessions (4-year duration) for candidates who enter through the UTME mode.
Direct entry candidates admitted to the 200-level in agriculture programmes will spend a minimum of 3 academic sessions (3-year duration).

Graduation requirements
To graduate, a student shall have undergone 4 years of study depending on his/her entry point, including one practical year of 6 months of Practicals. The activities of the practical year should include periodic seminars on the student's work as a way of stimulating interest as well as the presentation of a written report to be graded at the end of the year.
Course workload must meet the graduation requirements. Candidates admitted through the UTME mode shall have registered for at least a minimum of 120 units of courses for the 4-year track and 84 units for the 4-year (direct entry) as indicated under course requirements. Candidates must also have registered and passed all the compulsory courses specified for the programme.

The submission of an undergraduate project report based on supervised research is a graduation requirement, which must not be compromised. This requirement exposes the student to problem-solving techniques and provides him with an ability to organize ideas from literature and research findings. It should prepare the student for post-graduation career and for further training at the postgraduate level.

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45

CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course code	**Course title**	**Units**	**Status**	**LH**	**PH**
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	15	45
AGR 201	Principles of Crop Production	2	C	30	-
AGR 202	Introduction to Agricultural Economics, Extension and Rural Sociology	2	C	30	-
AGR 203	Introduction to Computer Application in Crop Science	2	C	15	45
WAM 201	Agro-meteorology and Biogeography and Climate Change	2	c	15	45
AGR 204	Introduction to Animal Production	2	C	30	-
CPS 205	Principles of Crop Physiology	2	C	30	-
AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
	Total units	**20**			

300 Level

Course code	**Course title**	**Units**	**Status**	**LH**	**PH**
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 311	Enterprise Appreciation	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
CPS 301	Arable Crops Production	2	C	30	--
CPS 302	Permanent Crops Production	2	C	30	-
CPS 303	Crop Pests and Diseases	2	C	30	-
CPS 304	Crop Genetics and Breeding	2	C	30	-

CPS 305	Farm Mechanization practices	1	C	-	45
CPS 306	Crop processing and Storage	1	C	-	45
CPS 307	Vegetables and orchard management	1	C	-	45
CPS 308	Statistics and data processing	2	C	30	-
	Total	**19**			

400 Level

Course code	**Course title**	**Unit**	**Status**	**LH**	**PH**
CPS 401	Vegetable Crop Production	2	C	15	45
CPS 402	Seed production Technology	2	C	15	45
CPS 403	Methods of Field Experimentation	2	C	15	45
CPS 404	Advanced crop protection	2	C	15	45
CPS 405	Weed science and control	2	C	15	45
CPS 406	Soil Fertility Management and Crop Nutrition	2	C	15	45
CPS 407	Irrigation practices in crop production	2	C	15	45
CPS 408	Post-harvest physiology and produce storage	2	C	15	45
CPS 498	Seminar	1	C	-	15
CPS 499	Final year project	4	C	-	180
	Total units	**21**			

Course Contents and Learning Outcome

100 Level

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. identify possible sound patterns in English Language;
2. list notable language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentation;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents

Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and

deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial time;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of Trade, Economic and Self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the Judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914; formation of political parties in Nigeria; Nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian Civil War). Concept of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigeria people; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage and development; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (the 3R's – Reconstruction, Rehabilitation and Re-orientation), Re-orientation strategies: Operation Feed the Nation (OFN), green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), mass mobilization for self-reliance, social justice and economic recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

AGG 102: Introduction to Agriculture I (2 Units C: LH 30)

Learning Outcome
At the end of these lectures, students should be able to:
13. have a broad understanding of the concepts and dimensions of agriculture in modern times with emphasis on Nigeria and the tropics;
14. acquire basic knowledge and understanding of the roles of agriculture and the place of soil, crop and animal resources in the production process as well as the constraints they face;
15. be familiar with the role of technologies in the transformation of agriculture; and
16. explain potentials and constraints to sustainable agricultural production

Course Content
Meaning and Scope of Agriculture. Importance of Agriculture to an expanded economy. Agricultural Ecology. Genetics, Agronomy. Rocks and Soil formation. Soil and Water Conservation. Soil Fertility. Land Preparation methods (soil tillage systems). Soil-water-plant relationship. Plant Forms and functions, Growth, Development and Reproduction. Plant Propagation Methods. Cropping Systems, Planting Patterns and Plant Densities. Crop Husbandry, Pasture and Forage Crops. Floriculture, Weeds, Crop Diseases, Crop Pests, Forest management (Silviculture), Crop Improvement, Animal Production, Forms and classification of major farm animals in West Africa, General terminology in animal production, Anatomy and physiology of farm animals, Reproduction in farm animals, Animal Nutrition, Livestock Management, Animal Health, Fisheries and Wildlife, Bee-keeping (Apiculture), Animal Improvement.

AGG 112: Introduction to Agriculture II (1 Unit C: LH 15)

Learning Outcome
At the end of these lectures, students should be able to:
10. Explain the history of agricultural development and the role of the public and private sectors.
11. Identify and analyse the factors of agricultural production and the role of various resources
12. Explain constraints of technology and mechanization, and the role of agricultural extension transformation.

Course Contents
History of Agricultural Development in West Africa, Roles of Government and NGOs in Agricultural Development, Factors of agricultural production, Basic Economic Principles, Characteristic Features of Agricultural Production, Labour Management, Farm Management, Marketing of Agricultural Produce, Agricultural Extension, Agricultural Technology, Farm surveying and farmstead planning, Simple Farm Tools, Farm machinery and implements, Mechanization and sources of farm power, Processing and storage, Introduction to biotechnology, Application of ICT in agriculture, Introduction to agricultural research and statistics.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes
On completion, the student should be able to:
1. identify and deduce the physical quantities and their units;

2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems based on the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents

Space and time; units and dimension, vectors and scalars, differentiation of vectors. displacement, velocity and acceleration; kinematics; Newton laws of motion (Inertial frames, Impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics, equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes, and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits.

PHY 102: General Physics II (Electricity & Magnetism) (2 Units C: LH 30)

Learning Outcomes

On completion, the student should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws;
6. explain the basics of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of AC voltages and currents in resistors, capacitors, and inductors.

Course Contents

Forces in nature, electrostatics, electric charge and its properties, methods of charging; Coulomb's law and superposition, electric field and potential. Gauss's law; capacitance, electric dipoles, energy in electric fields. Conductors and insulators, current, voltage and resistance, Ohm's law and analysis of DC circuits. Magnetic fields; Lorentz force, Biot-Savart and Ampère's laws, magnetic dipoles, dielectrics, energy in magnetic fields. Electromotive force, electromagnetic induction, self and mutual inductances, Faraday and Lenz's laws. Step up and

step down transformers: Maxwell's equations, electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

BIO 101: General Biology I (2 Units C: LH 45)

Learning Outcomes
At the end of the course, students should be able to:
1. explain cell's structure and organizations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents
Cell structure and organization, functions of cellular organelles, characteristics and classification of living things, chromosomes, genes - their relationships and importance. General reproduction, interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism). Heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms), elements of ecology and types of habitats.

BIO 107: General Biology Practical I (1 Unit C: PH 45)

Learning Outcomes
At the end of the lectures, students should be able to:
1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents
Common laboratory hazards: prevention and first aid; measurements in biology; uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy, and proportion; use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101**

CHM 101: General Chemistry I (2 Units C: LH 30)

Learning outcomes
At the end of this course, the students should be able to:
1. define atom, molecules, and chemical reactions;
2. discuss the Modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionization energies, electronegativity of the elements based on their position in the periodic table;

5. identify and balance oxidation – reduction equation and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridised orbitals;
7. identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using Le Chatelier's principle to predict the effect of concentration, pressure, and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy; and
10. determine rates of reactions and its dependence on concentration, time, and temperature.

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence forces; structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reaction, equilibrium, and thermodynamics. Acids, bases, and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of Transition metals.

Course Contents

Historical survey of the development and importance of organic chemistry; Fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, and nano-chemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids, and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning Outcomes
The students will be able to:
1. describe general laboratory rules and safety procedures;
2. collect scientific data and correctly carry out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. tell the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents
Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, the students should be able to:
1. identify general laboratory rules and safety procedures;
2. collect scientific data and correctly carry out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;
5. execute solubility tests on known and unknown organic compounds;
6. execute elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents

Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

MTH 101: Elementary Mathematics I (2 Units C: LH 30)
(Algebra and trigonometry)

Learning Outcomes
At the end of the course students should be able to
1. understand basic definition of set, subset, union, intersection, complements and use of venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. understand various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents
Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition, and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Learning Outcomes
At the end of the course students should be able to:
1. understand types of rules in differentiation and integration;
2. understand the meaning of function of a real variable, graphs, limits, and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents
Function of a real variable, graphs, limits, and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; integration as an inverse of differentiation. Methods of integration, definite integrals. Application to areas, volumes.

PHY 107/108: General Physics Practical I & II (2 Units C: PH 90)

Learning Outcomes
On completion, the student will be able to:
1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors; and
4. plot and analyse graphs, draw conclusions from numerical and graphical analysis of data.

Course Contents
This introductory course emphasises quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

200 Level

GST 212. Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes
A student who has successfully gone through this course should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;

6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyze the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world; and
8. state the basic principles of e-commerce

Course Contents

Concept of entrepreneurship (entrepreneurship, intrapreneurship/corporate entrepreneurship). Theories, rationale, and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator, and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge, and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

AGR 201: Principles of Crop Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students will be equipped with:

1. basic agronomic terminologies;
2. knowledge of and basis of crop distribution across climatic regions;
3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification; and
5. knowledge of soil management needs and some conservation practices

Course Contents

Definitions of the terms, crops, and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.). Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies.

Definitions of the terms, soil, and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.

AGR 202: Introduction to Agricultural Economics, Extension and Rural Sociology (2 Units C: LH 30)

Learning Outcomes

At the end of the course students will be able to:

1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over,
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents

The nature of economics and economic problems. Scope of agricultural economics and method. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The

components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology. Importance of rural communities and institutions, social stratification, social processes, and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

WMA 201: Agro-Meteorology, Biogeography and Climate Change (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the course, students are expected to know the following:

8. the meanings of climatology, climate change and biogeography;
9. the relationship between climatology, hydrology, and biogeography;
10. basic elements and factors of climate; and climate change variation characteristics
11. relationship between climate and plants, as well as climate and soils;
12. understand basic principles of climate change adaptation and mitigation
13. adaptation in plants and animals.
14. understand biodiversity and ecosystem sustainability, including bio-resource conservation.

Course Contents

Basic definitions and explanations in climatology and biogeography. The principles, aims and scope of climatology and biogeography. Climatological problems and investigation methods. Relationships with meteorology, biogeography and hydrology. Biodiversity and ecosystem sustainability. Principles of bio-resource conservation. Climatological data processing methods; basic factors of climate formation, influence of relief on climate and plants. Geographical distribution of climatic elements, plants, and animals. Climate and soil. The concept of adaptation in plants and animals. Classification of climates and biogeography of the earth. The elements and control of climate and weather and the dynamics o the earth's atmosphere. Radiation and heating of the atmospheric systems, atmospheric moisture, and the dynamics of pressure and wind systems. Condensation and precipitation processes. The tropical climate, relation between agriculture and climate with reference to crop, livestock; irrigation, pest and diseases. Climate change and variation characteristics, impacts and adaptations, the importance of common short (e.g. august break, harmattan) and long seasons (dry and rainy seasons) on agriculture.

AGR 204: Introduction to Animal Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students are expected to have known the following:

1. prospects and problems of the animal industry;
2. identification/description of types of farm animals;
3. feeds and feeding management of farm animals;
4. housing and management systems of different livestock;
5. principles of animal health management;

6. animal breeding and breed improvement principles; and
7. basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc).

Course Contents
The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production, feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry and rabbits). Introduction to game and companion animals; general principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation Anatomy and physiology of the cell, tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses, and other systems of farm animals.

CPS 205: Principles of Crop Physiology (2 Units C: LH 30)

Learning Outcomes
1. Learners have a vivid understanding of vital elements in crop growth and development;
2. Equips the learner with explanation on observed growth manifestations in the crop; and
3. A good theoretical background for interpretation of crop research experiments results.

Course Contents
Crop seed germination and dormancy. Growth juvenility, maturation, and dormancy. Environmental effect on translocation and metabolic processes in crop plants. Moisture needs and moisture stress effects. Temperature, light and solar radiation effects on growth. Photosynthesis and assimilate partitioning determinants. Growth regulators (growth hormones) and their manifestations. Growth analysis, growth indices and their estimation. Concept of growth and development.

AGR 206: Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: LH 30)

Learning Outcomes
At the end of this course students should be able to:
1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;
8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

Course Contents
Philosophy, scope, objectives, and historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post- harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food; factors contributing to texture, colour, aroma and flavour of food. Cost; traditional and ethnic influence of food preparation and consumption pattern.

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflict and violence;
3. differentiate between conflict and terrorism;
4. enumerate security and peace building strategies; and
5. describe roles of international organizations, media and traditional institutions in peace building

Course Contents
Concepts of peace, conflict, and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes, and rivalries. Economic inequalities, social disputes, nationalist movements, and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency, and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national, and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises
7. conduct entrepreneurial marketing and e-commerce;
8. apply a wide variety of emerging technological solutions to entrepreneurship; and
9. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies).

CPS 301: Arable Crops Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, student will be able to:

1. discuss diversity of arable crops;
2. discuss the need for crop improvement;.
3. explain crop production procedures;
4. describe harvesting and produce handling techniques; and
5. explain the utilization of each crop commodity.

Course Contents

Origin, distribution, soil, and climatic requirements for classes of arable crops, specifically cereals, legumes, root crops, fibre crops, vegetables, and other important arable crops in

Nigeria. Concept of improved crop varieties and the importance in crop productivity. Production practices, harvesting, utilization, processing, storage, and economic aspects of some selected major arable crops.

CPS 302: Permanent Crops Production (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students will be able to:
1. identify important plantation crops and discuss their specific production requirements;
2. describe different crop improvement techniques;.
3. discuss the food and industrial relevance of each of the crops; and
4. describe different methods of processing and preservation of the crop produce

Course Contents
Origin, distribution, soil, and climatic requirements of important permanent crops such as cocoa, oil palm, rubber, coffee, coconut, mango, sugar cane, bananas, plantains, citrus, kola, cashew, etc. Production practices, improvement, harvesting, utilization, processing, storage, and economic aspects of some selected permanent perennial crops.

CPS 303 : Crop Pests and Diseases (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students will:
1. appreciate the natural occurrence of pests and disease organisms in crop production field;
2. get intimated with different pests by way of identification; and
3. be informed on the need for control and the control methods of pests and diseases.

Course Contents
Definition of pests and diseases. Major pests of tropical crops (insects, fungi, viruses, bacteria, and nematodes). Study of specific insect pests of major crops. Symptoms and effects of diseases caused by fungi, viruses, and bacteria. Outline of advantages and limitations of different pest control methods. Integrated pest management approach. Nematode infestation symptoms and control.

CPS 304: Crop Genetics and Breeding (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students will be able to:
1. explain the basics concepts of genetics and plant breeding;
2. describe specific plant breeding methods;
3. explain the concept of inheritance in crop plants;
4. explain the sexual and asexual methods of plant propagation; and
5. Discuss the place of plant breeding in crop improvement.

Course contents
Cell structure and components, chromosomes; structure, number and variations, linkage and crossing over, mutation and genes in population. Multiple alleles, mitosis and meiosis. Theory of

evolution. Fundamental principles of inheritance. Mendelism. Introduction to population and quantitative genetics. Objectives and general principles of crop breeding including their application to self-pollinated, cross pollinated and vegetatively propagated crops. General and special methods of selection in inbreeders and out-breeders; compatibility, male sterility. Heterosis. Polyploidy in crop breeding, and mutation breeding.

CPS 305: Farm mechanization Practices (1 Units C: PH 45)

1. knowledge of farm machines and implements;
2. sufficient skill in tractorization activities in crop cultivation; and
3. appreciation of the inherent need for mechanization in crop production.

Course Contents

Familiarization with farm machines. Farm implements, their uses and coupling methods practically demonstrated. Tractor operation for basic field operations – ploughing, harrowing, and ridging. Involvement in equipment and tractor routine maintenance activities.

CPS 306: Crop Processing and Storage (1 Units C: PH 45)

Learning Outcomes

At the end of the course students will be able to:

1. operate produce processing equipment;
2. add value to crop produce;
3. package crop produce for local and export markets; and
4. appreciate the necessity for produce processing and packaging.

Course Contents

Familiarization with crop processing facilities for different crop produce. Engagement in the use of simple and machine-driven processing methods for diverse produce types. Produce packaging methods. Monitoring of changes and developments in stored produce.

CPS 307: Vegetable and Orchard Crops Management (1 Units C: PH 45)

Learning Outcomes

1. Learners should have acquired adequate skill for vegetable crop production as an enterprise; and
2. Interest arousal in orchard and plantation crops establishment

Course Contents

Vegetable seeds viability testing, vegetable nursery establishment and management.
Orchard crops propagation techniques; transplanting and raising of specific vegetable crops to harvesting stage. Acquisition of skills in orchard management using an existing orchard of any fruit tree.

400 Level

CPS 401: Vegetable Crops Production (2 Units C: LH 15; PH 45)

Learning Outcomes

1. Learners would be sufficiently familiar with the cultural (cultivation) practices for vegetable crops;
2. The course would have prepared the learners in the requirements for vegetable crops production as an enterprise; and
3. Broad knowledge of vegetable types and the peculiar interest in enterprise in vegetable crops production.

Course Contents

History, definition, classification, and importance of vegetable crops. Ecological distribution of vegetables and fruits in Nigeria. Varieties and adaptation of exotic vegetables and fruits to the Nigerian environment. Types and systems of vegetable and fruit production. Production practices, harvesting, handling, processing, storage, marketing and utilization of vegetables and tropical fruit crops. Methods of plant propagation. Nursery systems, diseases and pests of vegetables and fruit crops. Horticultural machines and equipment. Principles of producing, planting, maintaining ornamental trees, shrubs, perennials and fruits in the nursery, homes, and parks.

CPS 402: Seed Production Technology (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the course students will be able to:

1. understand the seed as a living entity;
2. equipped with handling and packaging methods for seed viability sustenance;
3. knowledge of simple seed testing methods; and
4. handling of seed dormancy for enhanced germination.

Course Contents

Structure and nature of seed, functions of parts of seed, seed viability, vigour, dormancy, and deterioration. Methods of breaking seed dormancy, production, processing, drying, treatment, packaging, storage and distribution of improved seed, seed certification. Procedures for field inspections; seed legislation and control. Seed testing procedures. Seed programmes in Nigeria. Seed marketing.

CPS 403: Methods of Field Experimentation (2 Units C: LH 15; PH 45)

Learning Outcomes

1. At the end of the course, learners should understand the concept experimentation, its purpose, and procedure; and
2. They should have a bit of the knowledge of data collection, collation, and analysis.

Course Contents

Principles of field experimentation in crop science. Research methodology; experimental plot layout and experimental designs, field survey; normal distribution and sampling; measurements

and data analysis. Sources of variation in field experiments. Single factor and factorial experiments. Analysis of variance, data transformation and means separation. Data collation and interpretation. Concept of mean, standard deviation, standard error, least significant difference, Duncan's multiple range test. Result presentation in tables and figures.

CPS 404: Advance Crop Protection (2 Units C: LH15; PH 45)

Learning Outcomes

At the end of the course, trainees would have:

1. competence in field insect pest management;
2. ability to identify specific disease symptoms on crops; and
3. competence in overall crop protection in crop production enterprise.

Course Contents

Practical identification of pests and disease pathogens on crop field. Familiarization with and mode of use of pest and disease control equipment. Practical involvement in insect pest management, disease control on diverse crops, nematode management. Practical aspects of phytosanitary.

CPS 405: Weed Science and Control (2 Units C: LH 30)

Learning Outcomes

1 Learners would appreciate the implications of weed in a production farm;
2 Adequate knowledge of implications of weed management as a factor in crop productivity; and
3 Informed on choice of weed control methods.

Course Contents

Characteristics, classification, and biology of weeds. Losses due to weeds. Weed control methods and problems associated with them. Classification, chemistry, selectivity, formulation, application, storage, and mode of action of herbicides. Herbicides and environmental interaction. Safety factors in the use of herbicides; basis for herbicidal selectivity. Application equipment and techniques, practical methods of controlling weeds in Nigeria.

CPS 406: Soil Fertility Management & Crop Nutrition (2 Units C: LH 30)

Learning Outcomes

1. Knowledge gained gives the learner the needed information on nutrient management for crop productivity;
2. Precise understanding of the characteristic nature of tropical soils and implication on soil management; and
3. Practical understanding of nature and use of fertilizer types.

Course Contents

Fertility in tropical soils. Soil organic matter; its properties and maintenance. Liming and its soil-plant relationship. Nitrogen, potassium, phosphorus, and sulphur contents of the soil. Fertilizers and fertilizer management including types, application methods, rates and timing. Major and

trace nutrient elements in crop nutrition. Nutrient absorption and loss routes. Soil fertility management in intensive and extensive cropping system. Role of leguminous crops in soil fertility management.

CPS 407: Irrigation Practices in Crop Production (2 Units C: LH 30)

Learning outcomes

1. The course equips the learner for irrigation as an alternative to rain-fed agriculture; and
2. It convinces the learner of the possibility of an all-year round crop production.

Course Contents

Forms of irrigation; costs and profitability of irrigation; application of irrigation to different crops. Soil-water-plant-atmosphere relationship; assessment of water requirements for crops including meteorological approach and critical growth stages for water of different field crops; scheduling irrigation for the major crops; time of irrigation; agronomic management of irrigated crops; crop rotations and sequence under irrigated conditions, evaporation losses of irrigation water; maintenance of irrigation equipment. Agronomic practices of crops in problem soils; soil erosion and soil drainage under irrigation or under natural rainfall.

CPS 408: **Post Harvest Physiology and Produce Storage (2 Units C: LH 30)**

Learning Outcomes

1. Learners will be able to appreciate a crop produce as a living entity requiring;
2. handling procedures that preserve the life in it;
3. Appreciate the magnitude of produce loss after harvest;
4. Knowledge from the course enables the learner to have consciousness of the implication of a storage environment on quality of a crop produce; and
5. Complete the value chain in crop production, with storage viewed as a critical stage in the value chain.

Course Contents

Storage life and harvested fruits, seeds, vegetables and flowers, tropical environment in relation to maturity, ripeness, and senescence. Physical and chemical indices of quality in fruits, seeds, vegetables, flowers, and other crop products. Storage of crop materials. Traditional methods of vegetable processing and storage. Fundamentals and principles of crop storage and transportation. Storage and shell life problems; ideal atmosphere for storing fruits, seeds, vegetables, flowers, and other crop products. Controlled environment for transit and long term storage; protective treatment, design and operation of equipment for storage and preservation.

CPS 499 : Final Year Project (4 Units C PH 180)

Each student is expected to choose and execute a special project under a supervisor. Duration of the project is 2 semesters.

Minimum resource standard

Laboratory facilities and practical equipment required

1. Photometers
2. Amino Acid analyzer
3. Atomic absorption spectrophotometer
4. 20 desktop computers for teaching purposes
5. Electron microscope
6. Audio visual aids
7. Non-refrigerated centrifuges (tabletop) for 15 and 50 ml Conicals
8. Refrigerated Centrifuges (tabletop) for 15 and 50 ml Conicals
9. Colorimeters
10. Spectrometers
11. Bench-top incubators
12. Transfer chamber
13. Lamina flow chamber
14. Gas chromatography coupled with mass spectrometer (GCMS)
15. Gas chromatography coupled with electroantenogram
16. Leaf area meter
17. Plant samples grinding machine (with stainless metal)
18. Microscopes (for large classes)
19. Weighing balances as appropriate for the department
20. Moisture meters
21. Water baths
22. Deep freezers
23. Refrigerators
24. Desk top computers
25. pH-meter w/articulated arm
26. Fume cupboard
27. Test tube shaker
28. Light meter

Others specifically relevant to Crop Science

1. Ovens dryers
2. Autoclaves
3. Distillation units
4. Gas chamber
5. Digestion units
6. Extraction units
7. Ashing equipment (Furnace)
8. pH meters
9. Flame photometers

The following are considered very mandatory for the Crop Science Programme

i. Teaching and research farm
ii. Crop type museum (2 hectares with a minimum of at least 10 different crop types)
iii. Minimum of 10 hectares of cropping land
iv. Farm workshop
v. On-farm produce processing and storage facilities
vi. Green and Screen Houses
vii. Irrigation facilities
viii. Silos **-** required to store grains produced from the teaching/research farm and for training students on the preservation of farm produce.

Personnel

1. **Academic Staff** – To comply with the NUC requirement of staff/student ratio of 1:15. A high proportion of staff should be doctoral degree holders with high level of practical experience. Staff should have a maximum of 15 contact hours per week for lectures, practicals, tutorials, and project supervision.

2. **Academic staff mix by rank**

   Professor/Reader – 20 %
   Senior Lecturer - 35 %
   Others - 45%

3. **Technical/Support**

Adequate number of support staff should be available as

a. Administrative Officers
b. Secretaries
c. Laboratory Technologists
d. Workshop and Studio Technicians
e. Farm Officers
f. Farm Technicians
g. Produce Processors
h. Farm Equipment Maintenance Technicians

Physical Facilities

1. Professorial offices
2. Academic staff offices
3. Support staff offices
4. Adequate laboratory space
5. Students seminar space
6. Adequate space for produce processing

Library and information resources

There must be adequate library facilities for staff and students in the core field of crop science and in related fields. Information sources will include current journals, text books, technical manuals/reports, proceedings of academic conferences, theses/dissertations and

projects. There must be provision of ICT-based access to electronic library resources as a virtual facility.

B.Sc. Family and Consumer Sciences

Overview

Family and consumer sciences (FCS) is the comprehensive body of skills, research, and knowledge that helps people make informed decisions about their well-being, relationships, and resources to achieve optimal quality of life. FCS programme will produce professionals who will enable individuals and families to manage the challenges of living and working.

The programme has three areas of specialization, namely: Human Development and Family Relations; Resource Management and Extension; and Clothing, Textiles and Interior Decoration. Courses in the different specialisations of the programme also provide students with the knowledge and skills needed to take on adult roles and responsibilities in their own families, communities, and world.

Philosophy

The philosophy of the Family and Consumer Sciences Programme is to produce graduate who would contribute effectively to the development of a just and self-reliant society. The programme applies science and knowledge of all kinds to develop individuals for careers, as well as for family and community life.

Objectives

The objectives of Bachelor of Science in Family and Consumer Sciences programme are to:

1. produce sound manpower in family and consumer sciences who will be self-employed, job creators and employers of labour, and assist in enhancing increased household productivity.
2. provide opportunities to share family and consumer sciences skills and knowledge with others in the society.
3. provide adequate foundation in family and consumer sciences, and adapt and adopt indigenous technology in order to solve local technical problems in family and consumer sciences.
4. promote and contribute to growth and improvement of family and consumer sciences in the country through research and communication.
5. produce high level manpower capable of improving the quality of family life through technological, educational and community action programmes

Unique features of the

1. The programme addresses the entrepreneurial needs of individuals at the local, national and global levels.
2. The programme has more specialized trending courses thus, encourages Specialists rather than generalists.
3. The programme is broader in scope therefore, gives the opportunity for professionalism and specialization.
4. The programme will help to produce graduates that are better equipped for further studies in their respective fields and who are better equipped to solve problems in their respective areas of specializations.

Employability skills

Graduates of family and consumer sciences should possess the following:

1. Problem solving skills – The ability to understand a problem by breaking it down into smaller parts, and identifying the key issues, implications and identifying solutions.
2. Organisational skills - Being organised and methodical. Able to plan work to meet deadlines and targets.
3. Initiative and being self-motivated - Having new ideas which can be made into a reality. Showing a strong personal drive and not waiting to be told to do things.
4. Communication and interpersonal skills - The ability to explain what you mean in a clear and concise way through written and spoken means.
5. Ability to learn and adapt - To be enthusiastic about work, and to identify ways to learn from mistakes for the benefit of both employee and employer.

21st Century skills

Students of family and consumer sciences should possess the following skills:

1. Critical thinking: Finding solutions to problems
2. Creativity: Thinking outside the box – Doing things differently
3. Collaboration: Working with others
4. Communication: Talking to others
5. Valuing diversity and difference: considerate of the different needs of different individuals.

Admission and Graduation Requirements

Admission Requirements

Candidates are admitted into the degree programmes in any of the following three ways:

1. The Unified Tertiary Matriculation Examination (UTME)
2. Direct entry

UTME - Four Year Degree Programme

In addition to UTME score, the candidate should possess five credit passes in Senior Secondary Certificate (SSC) including English Language, Mathematics, Chemistry, Biology or Agricultural Science and Economics at a maximum of two sittings and one from Foods and Nutrition, Fine Arts, Clothing and Textile. Candidates must have at least a pass in Physics.

Direct entry mode

Candidates must have at least 2 credit passes in Advance level in Chemistry and Biology plus Senior Secondary Certificate (SSC) credit passes in at least 5 subjects prescribed for UTME entry mode. Holders of ND and HND with a minimum of Upper Credit plus 5 Credits in Senior Secondary Certificate (SSC) at a maximum of two sittings are eligible for consideration for admission into 200 level. Candidates with N.C.E. in Home Economics or Home Science, Agricultural Science, Biology, Chemistry from an accredited institution with a minimum of Merit pass plus 5 Credits in Senior Secondary Certificate (SSC) at a maximum of two sittings are eligible for consideration for admission into 200 level.

Minimum duration

The minimum duration for B.Sc. Family & Consumer Sciences degree programme is 4 academic sessions (4-year duration) for candidates who enter through the UTME Mode. Direct Entry candidates admitted to the 200-level in Family and Consumer Sciences programme will spend a minimum of three years (3-year duration).

Graduation requirements

To graduate, a student should have undergone 3 or 4 years of study depending on his/ her entry point, including six months of internship. Candidates admitted through the UTME mode should have registered for at least a minimum of 120 units of courses for the 4-year programme and a minimum of 90 units for the 3-year (direct entry) programme. Candidates must also have registered and passed all the compulsory courses specified for the programme. The candidate must have undergone twenty-four weeks Industrial Training, submitted a written report and presented the report at a seminar. The submission of an undergraduate project report based on supervised research is a graduation requirement.

Degrees offered

Candidates who successfully fulfill the requirements for the programme shall be awarded degrees in their areas of specialisation:

1. B. Sc. Consumer Sciences (Human Development and Family Relations)
2. B. Sc. Consumer Sciences (Textiles, Clothing and Interior Decoration)
3. B. Sc. Consumer Sciences (Resource Management and Extension)

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-

CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course codes	Course title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and innovation	2	C	15	45
AGR 201	Principles of Agronomy	3	C	45	-
AGR 202	Introduction to Agricultural Economics, Extension and Rural Sociology	3	C	45	-
AGR 203	Introduction to Forestry and Wildlife Management	2	C	30	-
AGR 204	Introduction to Animal Production	2	C	30	-
AGR 205	Introduction to Fisheries and Aquaculture	3	C	45	-
AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
	Total	**19**			

Specialisation

300 Level: Human Development and Family Relations

Course code	Course title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
FCS 300	Industrial Training	12	C	-	24wks.
FCS 301	Research Methods	2	C	30	-
FCS 302	Report and Seminar on Industrial Training	3	C	-	135
FCS 303	Entrepreneurship in Family & Consumer Sciences	2	C	15	45
FCS 311	Human Development and Growth I	2	C	30	-
	Total	**25**			

400 Level: Human Development and Family Relations

Course codes	Course title	Units	Status	LH	PH
FCS 411	Org. of Family & Child Welfare Programmes	2	C	30	-
FCS 412	Parent-Child Relationship	2	C	30	-
FCS 413	Family Dynamics and Change	2	C	15	45
FCS 414	Adolescence and Adulthood	2	C	30	-
FCS 415	Family Life Education &Family Planning	2	C	30	-
FCS 402	Project	4	C	-	180
	Total	**14**			

300 Level: Textiles, Clothing and Interior Decoration

Course code	Course title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
FCS 300	Industrial Training	12	C	-	24wks
FCS 301	Research Methods	2	C	30	-
FCS 302	Report and Seminar on Industrial Training	3	C	**-**	135
FCS 303	Entrepreneurship in Family & Consumer Sciences	2	C	15	45
FCS 321	Introduction to Clothing and Textiles	2	C	15	45
FCS 323	Basic and Fabric Designs	2	C	15	45
FCS 325	Clothing Construction	2	C	15	45
	Total	**29**			

400 Level: Textiles, Clothing and Interior Decoration

Course codes	Course title	Units	Status	LH	PH
FCS 421	Pattern Drafting and Design	2	C	15	45
FCS 423	Advanced Clothing Construction & Tailoring Techniques	2	C	15	45
FCS 424	Interior Decoration and Design	2	C	15	45
FCS 402	Project	4	C	-	180
	Total	**10**			

300 Level: Resource Management & Extension

Course Code	Course Title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
AGX 313	Communication and Teaching Methods in Extension	2	C	30	-
FCS 300	Industrial Training	12	C		24wks
FCS 301	Research Methods	2	C	30	-
FCS 302	Report and Seminar on Industrial Training	3	C	**-**	135

FCS 303	Entrepreneurship in Family & Consumer Sciences	2	C	15	45
FCS 331	Household Resource Management	2	C	30	-
FCS 333	Consumer Education	2	C	30	-
	Total	**29**			

400 Level: Resource Management & Extension

Course code	**Course title**	**Unit**	**Status**	**LH**	**PH**
FCS 431	Advanced Resource Management	2	C	30	-
FCS 432	Analysis of Managerial Problems in the Community	2	C	30	-
FCS 433	Personal & Family Finance Management	2	C	30	-
FCS 402	Project	4	C	-	180
	Total	**10**			

NOTE

The course code is in the form: DEP LNJ (where 'L' in LNJ represents the level of the course; 'N' the middle digit represents the option offering the course (i.e. 0 = general course of the programme; 1 = Human Development and Family Relations option; 2 = Clothing, Textiles and Interior Decoration option; and 3 = Resource Management and Extension option); while 'J' in LNJ is the numbering of courses.

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. identify possible sound patterns in English Language;
2. list notable language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentation;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents

Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical

considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial time;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of Trade, Economic and Self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the Judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914; formation of political parties in Nigeria; Nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian Civil War). Concept of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigeria people; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage and development; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (the 3R's – Reconstruction, Rehabilitation and Re-orientation), Re-orientation strategies: Operation Feed the Nation (OFN), green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), mass mobilization for self-reliance, social justice and economic recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

BIO 101: General Biology I (2 Unit C: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. explain cell structure and organizations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents

Cell structure and organization. functions of cellular organelles. characteristics and classification of living things. chromosomes, genes their relationships and importance. General reproduction. Interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism). Heredity and evolution (introduction to Darwinism and Lamarckism, Mendelian laws, explanation of key genetic terms). Elements of ecology and types of habitat.

BIO 102: General Biology II (2 Units C: LH 30)

Learning Outcomes

At the end of the lectures, students should be able to:

1. List the characteristics, methods of identification and classification of Viruses, bacteria and fungi;
2. state the unique characteristics of plant and animal kingdoms;
3. describe ecological adaptations in the plant and animal kingdoms;
4. explain nutrition, respiration, excretion and reproduction in plants and animals; and
5. describe growth and development in plants and animals.

Course Contents

Basic characteristics, identification and classification of viruses, bacteria and fungi. A generalized survey of the plant and animal kingdoms based mainly on the study of similarities and differences in the external features. Ecological adaptations. Briefs on physiology to include nutrition, respiration, circulatory systems, excretion, reproduction, growth and development.

BIO 107: General Biology Practical I (1 Unit C; PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents

Common laboratory hazards: prevention and first aid; measurements in biology. Uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy and proportion. Use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101.**

BIO 108: General Biology Practical II (1 Unit C; PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. describe the anatomy of flowering plants;
2. differentiate types of fruit and seeds;
3. state ways of handling and caring for biological wares;
4. describe the basic histology of animal tissues; and
5. identify various groups in the animal kingdom.

Course Contents

Anatomy of flowering plants, primary vegetative body: stem, leaf and root to show the mature tissues namely parenchyma, collenchyma, sclerenchyma, xylem and phloem. Types of fruits and seeds. Care and use of dissecting kits and other biological wares. Dissection and general histology of animal tissues based on vertebrate forms. Morphology and functions of epithelial, muscular, nervous and connective tissues. Examination of various groups of lower invertebrates under microscopes, identification of various groups of organisms in Animal Kingdom. And any experiment designed to emphasize the practical aspects of topics in BIO 102.

CHM 101: General Chemistry I (2 Units C; LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. define atom, molecules and chemical reactions;
2. discuss the Modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionization energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation – reduction equation and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridized orbitals;
7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridization and shapes of simple molecules. Valence Forces. Structure of solids. Chemical equations and stoichiometry; Chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry. Rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II (2 Unit C; LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reactions;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of Transition metals.

Course Contents

Historical survey of the development and importance of Organic Chemistry. Fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The Chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C; PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify the differences between primary and secondary standards;

5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents

Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C; PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;
5. perform solubility tests on known and unknown organic compounds;
6. conduct elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents

Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

MTH 101: Elementary Mathematics I (Algebra and Trigonometry) (2 Units: C LH 30)

Learning Outcomes

At the end of this course students should be able to:

1. explain basic definition of Set, Subset, Union, Intersection, Complements and use of Venn diagrams;
2. solve quadratic equations;
3. Solve trigonometric functions;
4. identify various types of numbers; and
5. solve some problems using Binomial theorem.

Course Contents

Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers, integers, rational and irrational numbers. Mathematical induction, real sequences and series. Theory of quadratic equations. Binomial theorem. Complex numbers. Algebra of complex

numbers. The Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

MTH 102: Elementary Mathematics II (2 Units C LH 30) (Calculus)

Learning Outcomes

At the end of this course students should be able to:

1. identify the types of rules in differentiation and integration;
2. describe the meaning of Function of a real variable, graphs, limits and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents

Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of differentiation. Methods of integration, Definite integrals. Application to areas, volumes.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the student should be able to:

1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics.
4. apply Newton's laws to describe and solve simple problems of motion.
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects.
6. explain and apply the principles of conservation of energy, linear and angular momentum.
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Courses Contents

Space and time. Units and dimension, Vectors and Scalars. Differentiation of vectors: displacement, velocity and acceleration. Kinematics. Newton laws of motion (Inertial frames, Impulse, force and action at a distance, momentum conservation). Relative motion. Application of Newtonian mechanics. Equations of motion.Conservation principles in physics. Conservative forces. Conservation of linear momentum. Kinetic energy and work. Potential energy. System of particles. Centre of mass. Rotational motion:Torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates. Conservation of angular momentum. Circular motion. Moments of inertia. gyroscopes and precession. Gravitation: Newton's Law of Gravitation. Kepler's Laws of Planetary Motion. Gravitational Potential Energy. Escape velocity. Satellites motion and orbits.

PHY 102: General Physics II (Electricity & Magnetism) (2 Units C; LH 30)

Learning Outcomes

At the end of this course, the student should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of ac voltages and currents in resistors, capacitors, and Inductors.

Course Contents

Forces in nature. Electrostatics; electric charge and its properties, methods of charging. Coulomb's law and superposition. electric field and potential. Gauss's law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators, current, voltage and resistance. Ohm's law and analysis of DC circuits. Magnetic fields. Lorentz force. Biot-Savart and Ampère's laws. magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances. Faraday and Lenz's laws. Step up and step-down transformers: Maxwell's equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

PHY 107 - General Practical Physics I (1 Unit C; PH 45)

Learning Outcomes

At the end of this course, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

Course Contents

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

PHY 108 - General Practical Physics II (1 Unit C; PH 45)

Learning Outcomes

At the end of this course, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs;
5. draw conclusions from numerical and graphical analysis of data; and
6. prepare and present practical reports.

Course Contents

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements. The treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

200 Level

GST 212: Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes

A student who has successfully gone through this course should be able to:

1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents

Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

AGR 201: Principles of Agronomy (3 Units C: LH 45)

Learning Outcomes

Students will be equipped with:

1. basic agronomic terminologies;
2. knowledge of and basis of crop distribution across climatic regions;
3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification; and
5. knowledge of soil management needs and some conservation practices.

Course Contents

Definitions of the terms, crops and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.). Description (including diagrams) of

crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies.
Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.

AGR 202: Introduction to Agricultural Economics, Extension and Rural Sociology (3 Units C: LH 45)

Learning Outcomes
At the end of the course students should be able to:
1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over;
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents
The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology. Importance of rural communities and institutions, social stratification, social processes, and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

AGR 203: Introduction to Forest Resources & Wildlife Management (2 Units C: LH 15; PH 45)

Learning Outcomes

The students will be able to:

1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and
5. raise seedlings of economic tree species.

Course Contents

Renewable natural resources availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria. Silviculture, afforestation characteristics of major timbers and their uses. Forest production activities. Forest protection. Regulation of harvests for sustained yield. Importance of forestry and wildlife to the national economy. Practical approach to apiculture, snailery, cane rat farming and other forest enterprises.

AGR 204: Introduction to Animal Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students are expected to have known the following:

1. Prospects and problems of the animal industry;
2. Identification/description of types of farm animals;
3. Feeds and feeding management of farm animals;
4. Housing and management systems of different livestock;
5. Principles of animal health management;
6. Animal breeding and breed improvement principles; and
7. Basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc).

Course Contents

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production, feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and rabbits). Introduction to game and companion animals; general principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation Anatomy and physiology of the cell, tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses, and other systems of farm animals.

AGR 205: Introduction to Fisheries and Aquaculture (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students will be able to:

1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

Course Contents
Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological, economic, and cultural importance of fisheries park, zoo, sport fishing, marine park, etc. Scope of fisheries and aquaculture.

AGR 206: Principles of Family and Consumer Sciences, Food Science and Technology (2 Units; C) (30 LH)

Learning Outcomes
At the end of this course students should be able to:
1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;
8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

Course Contents
Philosophy, scope, objectives and historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology.

Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post- harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food; factors contributing to texture, colour, aroma, and flavour of food. Cost, traditional and ethnic influence of food preparation and consumption pattern.

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning outcomes

At the end of the course, students should be able to:

1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflicts and violence;
3. differentiate between conflict and terrorism; enumerate security and peace building strategies; and
4. describe roles of international organisations, media, and traditional institutions in peace building.

Course contents

Concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes and rivalries. Economic inequalities, social disputes, nationalist movements and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical

location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises; conduct entrepreneurial marketing and e-commerce;
7. apply a wide variety of emerging technological solutions to entrepreneurship; and
8. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents
Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies).

AGX 313: Communication and Teaching Methods in Extension (2 Units C: LH 30)

Learning outcomes
At the end of the course, the students should be able to:
1. describe communication as a process and identify major bottleneck to effective communication;
2. describe the selection and use communication tools in extension;
3. differentiate between teaching and learning based on their principles;
4. learn how to organize and conduct extension meetings with farmers and other value chain actors; and
5. appreciate how to apply the concept of e-extension in communication process.

Course Contents
Communication theories and systems, factors influencing effective communication; Communication process and communication strategies for agricultural and rural development programmes; Importance, selection, preparation and production techniques of agricultural communication tools in extension; Development and selection of ICT-based agricultural communication tools – video production, graphic design, visual composition, desktop publishing and multimedia development; ICTs for extension management – management of extension resources, programmes, and monitoring extension impacts; extension teaching methods and

aids, meaning of the concepts of teaching, learning and motivation, steps and principles of teaching and learning. Preparation and use of extension materials; guide sheet, handouts, modules, newsletters, audio, visual sound recording, video, photography, transparencies, slide, posters, flip chart, and extension report; identifying audience objective and needs; utilizing locally available materials, pre-testing, modifying, retesting, production, and distribution process; evaluating effectiveness of extension materials. Introduction to e-extension.

FCS 300: Industrial Training (12 Units C: PH 24weeks)

Learning Outcomes

At the end of the course, the students should be able to:

1. apply the theoretical knowledge gained in classes to the real practice;
2. develop skills and techniques directly applicable to individual careers;
3. develop skills in work ethics, communication and management; and
4. build the strength, teamwork spirit and self-confidence of individuals.

Course Contents

Students will be posted to recognised and relevant placement areas of their choice during the industrial training. Continuous assessment of students will be undertaken jointly by their industrial-based supervisors, ITF officials and institutional supervisors. Finally, students on returning to the institution will present a seminar on major duties performed and skills acquired during the training. Grades are allotted according to ITF directives.

FCS 301: Research Methods (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. develop scientific methods of identifying problems of individuals, families and communities;
2. apply scientific methods to solving problems of individuals, families and communities;
3. develop scientific skills of collating, analyzing and presentation of data; and
4. write a scientific report and present it.

Course Contents

Introduction to scientific methods. Defining a research problem. Developing objectives and hypotheses. Research design and measurements. Types of data instrument. Data collection. Sampling techniques. Statistical analysis of data. Data presentation. Report writing.

FCS 302: Report and Seminar on Industrial Training (3 Units C: PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. acquire the ability to follow discussions, oral arguments, and presentations, noting main points or evidence and tracking threads through different comments;
2. develop the ability to prepare appropriately to participate effectively in class discussion;
3. demonstrate the ability to construct a paper consistent with expectations of the programme, including an appropriate organization, style, voice and tone;

4. demonstrate the ability to perform critical reading of own writing and the writing of others; and
5. develop competence in working with a methodology, structuring their oral work, and synthesizing information.

Course Contents
Students returning to the institution from Industrial Attachment will write and submit a very detailed term paper on an approved topic which is practically relevant to the current issues in Consumer Sciences with bias on his or her options. Students will formally present their reports in seminars where various intellectual, academic, and cultural virtues would be assessed.

FCS 303: Entrepreneurship in Family and consumer sciences (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. explain the basic concepts about entrepreneurship;
2. identify factors affecting the growth and development of entrepreneurship;
3. apply the various concepts to an understanding of new business creation;
4. demonstrate knowledge of the legal and ethical environment impacting businesses;
5. identify and apply strategies for solving problems on entrepreneurial project; and
6. describe the role and importance of the small and medium sized enterprises in the economy.

Course Contents
Entrepreneurship – concepts, development and need for entrepreneurial development. Entrepreneurship growth – economics, social, cultural. Personality, psychological and sociological factors affecting growth. Traits for entrepreneurial development –functions and roles of women entrepreneurs. Problems and strategies for solving problems on entrepreneurial project. Importance and scope of entrepreneurship. Need for developing enterprise. Practical contributions from all consumer sciences options.

FCS 311: Human Development and Growth I (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. recognise different stages of social, emotional, intellectual and physical development of a child;
2. identify the needs of a developing child at different stages of growth;
3. differentiate between underdeveloped and developed children; and
4. apply theories of development to provide for the needs of a developing child.

Course Contents
In depth exploration of the social, emotional, intellectual and physical development of the child from infancy to middle childhood. Special attention will be devoted to the development needs of the young child and the implications of such needs for the development of age appropriate materials and for the design of community and school based programmes. Students will be

expected to actualize theories by practical with young children. The focus will be on infants and one and two-year olds.

FCS 321: Introduction to Textiles and Clothing (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, students should be able to:
1. discern various preliminary and decorative stitches;
2. identify and classify fibre based on physical and chemical properties;
3. differentiate between natural and synthetic fibres;
4. develop competency in measurement of diverse body figures; and
5. identify and operate varied sewing equipment.

Course Contents
Concept of textile and clothing. Textile serviceability and performance. Textile application and selection. Fibre classification, properties and identification. Physical and chemical characteristics of fibres (natural and synthetic). Identification of sewing equipment. Body measurement. Decorative and preliminary stitches in clothing construction.

FCS 323: Basic and Fabric Designs (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. apply basic elements of design to fabric of different texture and colour;
2. evaluate different printing techniques and apply the most appropriate to fabric; and
3. synthesise different designs to create different patterns on fabrics.

Course contents
Basic design – Introduction to the basic elements of design, line, texture, value, tones, colours. Perspective – rules relating to observation. Drawing of simple geometric forms – cuboids, cones, cylinders. Exploration of various techniques of printing and dyeing fabrics. Exploration of various environmental and traditional African design motifs for printed and dyed fabrics.

FCS 325: Clothing Construction (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. identify fabric appropriate for different garment construction;
2. design and construct simple and complex trending garments;
3. demonstrate proficiency in applying technologies to design and construct garments; and
4. identify and assess the functional, technical, and aesthetic aspects of apparel.

Course contents
Fabric identification and selection for garments construction. Concept of clothing fluency. Fashion producers and designing in clothing. Tailoring tricks. Basic clothing construction methods and garment embellishment. Fundamental of decorative details. Advanced tailoring tricks. Laying of pattern and transferring pattern lines. Principles of stay-stitching in clothing constructions. Fabric layout and cutting. Basic ironing and pressing techniques. Notions

selection and fixing. Application and adaptation of trims, laces and edging in clothing construction.

FCS 331: Household Resource Management (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. apply management principles to managing resources for better results;
2. effectively and efficiently manage personal, household and community resources;
3. make informed decisions about utilization of resources; and
4. apply scientific skills to manage available resources in the work place.

Course Contents
Definition of household resource management. Definition, classification and characteristics of resources. Steps in the management process. System's approach to family resource management. Motivating factors in management – goals, values, and standards. Communication process in family. Decision making process. Work simplification techniques in family activity management.

FCS 333: Consumer Education (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. make informed buying decisions in all economic situations;
2. develop responsible attitudes toward the use of resources;
3. use the professional skill to develop sound decision-making process based on individual goals and values; and
4. evaluate the interdependent roles of the consumer, the worker, and the citizen in the economy.

Course Contents
Definition and principles of consumer education. An analysis of economic forces affecting individuals and families as consumers of goods and services. Creating awareness of the rights and responsibilities of consumers in the market place, developing aids and techniques for making intelligent choices of goods and services. Political, social, economic and legal implications of consumer decisions and actions. Introduction to consumer programmes, regulations, laws and their effectiveness in Nigeria.

400 Level

FCS 411: Organisation of Family & Child Welfare Programmes (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. competently identify and provide developmental needs of children to ensure optimal growth;
2. identify and evaluate factors that contribute to successful learning by children;

3. apply principles and appropriate techniques to organizing welfare programmes for child and family;
4. develop skills to create environments that are healthy, respectful, supportive, and challenging for each child and family; and
5. apply their knowledge to design, implement, and evaluate experiences that promote positive development and learning for every young child.

Course Contents
Concept of child welfare system, child welfare services, child welfare practices, child protection services, children's rights. Definition, functions, goals and responsibilities to children needs and family. Structure, principles and purposes of child and family welfare programme. Guardianship and state of guardianship. Adoption meaning, process and implications on child welfare programme. Differences between guardianship and adoption. Family caregiving. Family caregivers and services provided. Family organisations – home placement and family care home. Impact of caregiving on family caregiver. Caregiving for elders. Caregiving and sibling relationships, challenges and opportunities. Family caregiver alliance. Women, work and caregiving.

FCS 412: Parent-Child Relationship (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. develop positive relationships with other people at home, workplace and the community;
2. establish a secure bond and friendships with peers; and
3. identify and strengthen different positive factors influencing relationships in the society.

Course Contents
Meaning of parent–child relationship. Parent-infant attachment and characteristics of the child. Parent-Child relationship and potential problems. Factors that affect parent-child relationships and tips to strengthening positive parent-child relationship. Different types of parent-child relationships and their characteristics. Unhealthy parent-child relationship and solutions. Mothers and fathers as caregivers and characteristics of competent caregivers. Family relationship – husband-wife relationship, parent-child relationship and factors that influence family relationship. Communication in families such as parent-child communication and the changing nature of communication.

FCS 413: Family Dynamics and Change (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. distinguish the historical changes that have occurred within the family;
2. differentiate the strengths and weaknesses of diverse family structures;
3. evaluate the effects of values and goals on family life;
4. analyse the positive and negative effects of divorce and remarriage on family members; and
5. research multi-cultural influences on family life.

Course Contents
An in-depth examination of the family as an economic unit. Intra-house dynamics. Processes of interaction and decision making. Division of roles and factors determining such division. Family as a unit of analysis, production, and consumption. Changes in family structure and factors influencing such changes. Conflicts and integration within the family. Inter-relation of these to the larger society.

FCS 414: Adolescence and Adulthood (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. identify and explain the biological, psychological, and socio-cultural aspects of adolescent and emerging adulthood;
2. critically compare and contrast various perspectives and opinions related to adolescent and emerging adulthood development;
3. identify and explain the most crucial research as it relates adolescent and emerging adulthood development; and
4. evaluate the experiences of adolescence and emerging adulthood as it relates to personal and individuals' lives.

Course Content
Theories relating to the development and growth from adolescence through senescence. Emphasis will be on the unique tasks and activities confronted by individuals at each developmental stage. Physical maturation and psychological development tasks. Sexuality and sex. Independence and personality identity. Peer relationships and values. The effects of individual differences and the socio-cultural context on reactions to stress at each stage will be examined.

FCS 415: Family Life Education and Family Planning (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. evaluate various methods of family planning;
2. educate individuals and families on the best methods of family planning; and
3. apply theories to practically impart sex education to individuals and families.

Course Contents
Meaning family life education and family planning. Importance of family life education and family planning. Components and benefits of family planning. Some family planning methods and application. Sex education and marriage. Theories, principles and techniques for education of parents in understanding the needs of their families. Directed experience in parent education programme. Discussion of parent counselling and home visits for development of better relationship between parents and their children.

FCS 421: Pattern Drafting and Design (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:

1. acquire skills to apply and use basic blocks in garment making;
2. identify and use appropriate equipment for drafting and design different patterns;
3. develop ability to convert fullness of garment with different techniques;
4. demonstrate proficiency in pattern drafting of different parts of a garment; and
5. develop ability to apply pattern making principles to create design variations and construct garments.

Course Contents
General information on equipment used. How to analyse a design. Design techniques. Use and importance of basic blocks. Pattern making. Introduction to dart manipulation. Basic flat pattern-drafting on front and back bodies, necklines, collar, skirt, sleeve, pants, shirt.

FCS 423: Advanced Clothing Construction & Tailoring Techniques (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. Develop skills in selecting fabrics and styles suitable for children's wear;
2. Analyse and select different methods for constructing supporting fabric and facings;
3. Apply special techniques for handling of various fabrics during garment construction;
4. Demonstrate ability to select appropriate fabrics, design and construct suitable costumes for men and women of different ages; and
5. Construct tailored garments in correct sequence of operations.

Course Contents
Sewing with knits. Fundamental of fitting and fitting problems. Special techniques for handling of various fabrics during construction. Selection and construction methods for supporting fabric (underlining and interfacing) and facings. Average allowance for liveability and fitting ease. Suitable fabrics and styles for children's wear. Costumes for men and women of different ages and occasions.

FCS 424: Interior Decoration and Design (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. recognise the elements and principles of design and their applications;
2. demonstrate competency in the design process;
3. pursue careers as interior design educators, directors of interior design research, and practitioners of interior design;
4. contribute to, and advance the body of knowledge pertaining to interior design and the built environment; and
5. develop the ability to select furniture, fixtures and finish materials for interior spaces*.*

Course Contents
Application of design principles to interior decoration and arrangement of living space. Analysis, organization and development of multi-functional spaces within living environment. Exploration of interior living environment, contemporary and traditional residential areas in an ecological, behaviour cultural context.

FCS 431: Advanced Resource Management (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. competently apply management concept to managing individual and family's resources;
2. facilitate how to solve individual and family managerial problems;
3. demonstrate critical thinking and problem-solving skills; and
4. offer professional advice to individuals and families to effectively and efficiently manage their resources.

Course Contents
An overview of resource management. Application of management theory and concept to managing families with emphasis on case study analyses. Personal examination and problem solving. Issues include conflict resolution, balancing work and family, and working with families at risk. Management applied to specific resources – money, time, energy. Special managerial problems related to family resource management. Rationale in decision-making.

FCS 432: Analysis of Managerial Problems in the Community (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. identify problems and crisis experienced by individuals, families and communities;
2. apply management strategies to handle problems and challenges of individuals families and communities;
3. demonstrate critical thinking and problem-solving skills; and
4. recognise when change is needed, adapt to change as it occurs, and lead change.

Course Contents
Identification of problems. Challenges and crisis faced by individuals, families and communities. Analysis of causal factors as well as the managerial abilities and weakness of those involved. Application of management strategies in handling problems and challenges.

FCS 433: Personal and Family Finance Management (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. Demonstrate management of financial resources to meet goals;
2. Evaluate the impact of technology on individual and family resources;
3. Discuss the importance of taking responsibility for personal financial decisions;
4. Describe how insurance and other risk-management strategies protect against financial loss; and
5. Design a basic spending and savings plan.

Course Contents
Analysis of personal standards, needs, aptitudes and goals. Personal decision making. Personal finance topics such as making money, banking, saving and investing. Managing credit. Managing risks and insurance. Financial planning for daily needs now and for the future

(budgeting). Financial management. Consumption and expenditure. Record keeping and financial statement.

FCS 402: Research Project (4 Units C: PH 180)

Learning Outcomes

At the end of the course, the students should be able to:

1. develop a research question, problem, or design;
2. develop a research proposal to address or resolve a specific research question;
3. apply basic principles and knowledge found in the literature related to the research question;
4. collect, interpret, and critique data to resolve a research question; and
5. communicate research findings.

Course Contents

Application of scientific method to defining research problems in student's area of specialization through empirical field survey or experimental design. Each student will submit report of his/her project based on original research work carried out under staff supervision. The report will be presented and graded accordingly.

Minimum Academic Standards

Equipment

The following equipment should be provided in adequate quantity depending on the numerical strength of the students:

Food Laboratory

1. Refrigerator
2. Deep freezer
3. Gas cooker
4. Gas cylinders
5. Fire extinguisher
6. Pressure cooker
7. Grinding stone
8. Cutting board
9. Mortar and pestle
10. Blender
11. Cake mixer
12. Buckets
13. Storage containers
14. Cooking utensils/kitchen equipment
15. Measuring cups, measuring spoons
16. Weighing balances
17. Thermometers
18. Bowls, plates, tea Cups, tumblers
19. Table wares
20. Round bottom flask

21. Bunsen burners
22. Exhaust hood
23. Animal cages
24. Weighing scales for animals and human babies
25. Tapes
26. Callipers
27. Desiccators
28. Crucibles
29. Kettles
30. Drying Oven
31. Micro wave oven

Clothing and Textiles Laboratory

1. Looms
2. Dress Forms
3. Cutting Tables
4. Straight and Pinking Shears
5. Zig-zag Sewing Machines with Foot Treadles
6. Straight Sewing Machines
7. Knitting Machine
8. Irons
9. Pressing Tables
10. Sleeve Boards
11. Sewing Tools
12. Wall Mirror
13. Yard Stick
14. French Curve
15. Tracing Wheels
16. Drafting Tools
17. Launder O meter
18. Vacuum Cleaner
19. Printing table
20. Exposure machine
21. 3D printing machine
22. CAD machine
23. Pattern cutter

Child Development Laboratory

1. Children's Furniture
2. Toys
3. Child Assessment Tools
4. Television Sets
5. Cable Network Decoders
6. Baby's cot
7. Beddings
8. Refrigerator

Staffing

(a) Academic Staff

Staff/students ratio of **1:15** recommended by the NUC shall apply. There shall be a minimum of six (6) Lecturers in each area of specialisation, with a reasonable number of doctoral degree holders. The academic staff pyramid should be composed as follows:-

1. Professor/Reader - 20%
2. Senior Lecturer - 35%
3. Lecturer 1 and below - 45%

Technical Support Personnel

For each laboratory: There should be a minimum of one (1) Technologist and one (1) Laboratory Assistant. A minimum of academic staff to technical staff ratio of 5:1 should be maintained.

Administrative Staff

There shall be a minimum of four (4) administrative staff comprising:

1. One Confidential Secretary,
2. One typist,
3. One clerk, and
4. One dispatch officer

Library

There must be adequate library facilities to cater for the needs of staff and students in the programme in the Department. These include; current journals, handbooks, textbooks, manuals, codes of practice, standards and specifications among others. in sufficient numbers. Most importantly, there shall be provision for ICT-based access to electronic resources and the information super highway.

classrooms, laboratories, workshops, studios, offices

The NUC recommends the following physical space requirement:

		m^2
Professor's Office	-	18.50
Head of Department's Office	-	18.50
Tutorial Teaching Staff's Office	-	13.50
Other Teaching Staff Space	-	7.00
Technical Staff Space	-	7.00
Secretarial Staff Space	-	7.00
Academic Staff Research Laboratory	-	16.50
Seminar Space/per student	-	1.85
Laboratory Space/student	-	7.50

B.Sc. Fisheries and Aquaculture

Overview

Fisheries and aquaculture graduates, more than ever, are tasked to acquire necessary training and content knowledge required of them in the 21st Century to compete globally and address many important issues in the quest for sustainable development of Nigeria. Aside the key roles they play in food and nutritional security, employment and livelihood and foreign exchange earnings, the two sources of fish, aquatic plant and shellfishes fundamentally impact on the quest of Sustainable Development Goals (SDGs).

This document thus provides a menu of anticipated outcomes, courses to be taught with topics to be covered in each course, how the courses should be evaluated and the human and material resources needed to deliver the courses in the fisheries and aquaculture programme. It formed the basis for the standards against which the undergraduates of fisheries and aquaculture are trained.

It is modelled as an outcome-based benchmark statements for fisheries and aquaculture programme that provide commonality of training to all the students in the programme with both the required international and national flavour as well as specific local needs to ensure that graduates are able to discharge their duties in the quest for being employers of labour or skilled employee in the fisheries and aquaculture industry.

Philosophy

The programme is designed to provide a general and in-depth knowledge in various areas of Fisheries and Aquaculture, with emphasis on exposure to application of Fisheries and Aquaculture in solving the problems of mankind in food and nutrition security, job and livelihood provisioning, sustainable ecological and social-economic development. The programme will train students in qualitative and quantitative approaches using multi-disciplinary lens.

Objectives

The objectives of B. Fisheries and Aquaculture programme are to:

1. produce proficient graduates with vast knowledge of fisheries to satisfy the high-level manpower needed by the nation in Fisheries and Aquaculture with orientation towards entrepreneurship skills and self-employment.
2. produce graduates with sufficient theoretical and technical knowledge in all aspects of Fisheries and Aquaculture and possess abilities to apply the analytical tools, knowledge and skills acquired to the solution of societies' economic problems.
3. produce graduates that are well-equipped with up-to-date techniques in fisheries necessary for sustainable fish production who will be able to perform satisfactorily in any of the following institutions: River Basin Authorities, Federal and State Ministries of Agriculture, industrial fish firms, fish farms and developmental agencies, among others.
4. produce graduates who are prepared for postgraduate studies in all areas of specialisation in Fisheries and Aquaculture across the globe.

Employability skills

This document is prepared to provide

1. the undergraduate with the necessary skills to develop critical thinking (problem-solving) ability which will promote better learner engagement, academic progress, and future success in the work-place;
2. through courses and the examination system, training in communication, a skill that enhances higher grades and graduation rates, better hunting opportunity for and at work, and life generally;
3. students with exposure through entrepreneurial course in fisheries and aquaculture, and conduct research in a bid to develop their creativity (produce novel and useful ideas) and keep pace with innovation towards being employers of labour and productive employees in fisheries and aquaculture industry;
4. the spirit of collaboration which is further promoted through team-work during their group presentation and industrial training. This is to promote their abilities in interpersonal communication, conflict-resolution and task management;
5. Also, the entire course system and examinations are designed to develop the students' self-management ability through core skills: planning, organisation, persistence, progress monitoring, control and attention to detail; and,
6. The programme broadly in conjunction with non -curricular activities are intentionally and strategically designed so that the students manage their emotions, behaviour, effort, and environment in the pursuit of their goals. Leadership and social responsibility skills are impacted on the students. Leadership skills are developed so that students are capable of challenging assumptions, establishing visions and possibilities for the future, fostering collaboration by promoting communication and cooperation, respecting and acknowledging followers' contributions, empowering followers to complete high-quality work, maintaining accountability and the ability to give or provide mentorship and support to help followers achieve their goals.
7. Social responsibility through co-curricular activities which encourages students to provide support for the needy and other social services in the society.

21st Century skills

The Fisheries and Aquaculture programme address the skills aside the subject contents using the following 21st century skills:

1. Communication;
2. critical thinking;
3. problem-solving; and
4. collaboration required by the undergraduate.

Unique features of the programme

The Fisheries and Aquaculture programme provides undergraduates the opportunity to be trained in the two aspects of fish production- capture and culture.

1. Sustainability

It allows training in all ramifications of sustainability pillars- social, economic and environmental themes. There is deliberate effort to situate science, economic and social knowledge in training of students so that they uniquely emphasise that fisheries and aquaculture are beyond the

narrow prism of food and nutrition security, employment and livelihood but also impact on many of the Sustainable Development Goals (SDGs).

2. Broad scheme

The broad spectrum of courses offered allow students to acquire contents knowledge, skills and training at both upstream and downstream of the fisheries and aquaculture industry. and prepares them to being in position to appreciate the opportunities and use such as they come through the ever-dynamic fisheries and aquaculture value chain.

3. New paradigm

New courses are introduced such as the Fisheries and Aquaculture in the Blue Economy, Entrepreneurship in Fisheries and Aquaculture, and addition narratives are added to existing synopsis to ensure that students receive content knowledge which prepares them to fit into increasingly globalised world of fisheries and aquaculture either as entrepreneurs employees and scholars in any fisheries and aquaculture programme all over the world.

Admission and Graduation Requirements

Admission requirements

Candidates are admitted into the degree programme in any of the following ways:

1. Unified Tertiary Matriculation Examination (UTME)
2. Direct entry

UTME: Four-Year Degree Programme

in addition to UTME score, the candidate should possess five credit passes in Senior Secondary Certificate (SSC) to include English Language, Mathematics, Biology or Agricultural Science, Chemistry and Physics in not more than two sittings.

Direct entry mode

Candidates must have at least 2 credit passes in Advance level or its equivalents in Chemistry and Biology plus Five SSC (or its equivalent) credit pass prescribed for UTME entry mode.
Diploma Holders in Fisheries and Aquaculture and related field with a minimum of Lower Credit plus Five SSC (or its equivalent) credit pass Level at a maximum of two sittings are eligible for consideration for admission into 200 level.

Graduation requirements

To be eligible for graduation a student must have satisfied the following:

1. The minimum credit units required of 120 for students admitted through UTME and 40 for direct entry;
2. The stipulated number of years for graduation;
3. All core and required courses as indicated in this CCMAS; and
4. Prerequisite courses and passed them before registration for a corresponding course at a higher level.

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course code	Course title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence;	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	15	45
AGR 201	Principles of Crop Production	3	C	45	-
AGR 202	Introduction to Agricultural Economics, Extension and Rural Sociology	3	C	45	-
AGR 204	Introduction to Animal Production, Fisheries and Aquaculture	2	C	30	-
AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
*FAA 201	Entrepreneurship in Fisheries and Aquaculture	2	C	30	-
	Total units	**16**			

300 Level

Course code	Course title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
FAA 301	Fisheries Biology	2	C	15	45
FAA 302	Fish Nutrition	2	C	15	45
FAA 303	Ichthyology (Systematics of Fish	2	C	15	45
FAA 304	Fish Gear Design and Production	2	C	15	45
FAA 305	Limnology	2	C	15	45
FAA 306	Fisheries Ecology	2	C	15	45
FAA 307	Principles of Aquaculture	2	C	15	45
FAA 308	Fisheries Stock Assessment	2	C	15	45
FAA 399	SIWES	6	C	-	360
	Total units	**26**			

400 Level

Course code	Course title	Units	Status	LH	PH
FAA 401	Fish Processing, Handling, Utilization Technology and Control	2	C	15	45
FAA 403	Pond Construction and Management; Fish Gear Design, Production, Use and Maintenance	2	C	15	45
FAA 404	Fish Fry and Fingerlings production; Hatchery management; Fish production and Management and Fish Food Nutrition and Fish Food Technology	2	C	15	45
FAA 405	Fish Marketing, Marketing Management, Accounting Practices and Fisheries Economic	2	C	15	45
FAA 407	Aquatic Environment survey; climate change in fisheries and aquaculture	2	C	15	45
FAA 410	Information and Communication Technologies and value chain in Fisheries and Aquaculture	2	C	15	45
FAA 499	Project and Seminar	4	C	-	270
Total units		**16**			

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students will be able to:
8. identify possible sound patterns in English Language;
9. list notable Language skills;
10. classify word formation processes.;
11. construct simple and fairly complex sentences in English;
12. apply logical and critical reasoning skills for meaningful presentations;
13. Demonstrate an appreciable level of the art of public speaking and listening; and
14. write simple and technical reports.

Course Contents
Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
9. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
10. list and identify the major linguistic groups in Nigeria;
11. explain the gradual evolution of Nigeria as a political unit;
12. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
13. enumerate the challenges of the Nigerian State towards nation building;
14. analyse the role of the judiciary in upholding people's fundamental rights;
15. identify acceptable norms and values of the major ethnic groups in Nigeria; and
16. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents
Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people,; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition,; citizenship and civic responsibilities; indigenous languages, usage, and development,; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation.; Re-orientation Strategies: Operation Feed the Nation (OFN), Green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments.

AGG 102: Introduction to Agriculture I (2 Units C: LH 30)

Learning Outcome
At the end of these lectures, students should be able to:
17. have a broad understanding of the concepts and dimensions of agriculture in modern times with emphasis on Nigeria and the tropics;
18. acquire basic knowledge and understanding of the roles of agriculture and the place of soil, crop and animal resources in the production process as well as the constraints they face;
19. be familiar with the role of technologies in the transformation of agriculture; and
20. explain potentials and constraints to sustainable agricultural production

Course Content
Meaning and Scope of Agriculture. Importance of Agriculture to an expanded economy. Agricultural Ecology. Genetics, Agronomy. Rocks and Soil formation. Soil and Water Conservation. Soil Fertility. Land Preparation methods (soil tillage systems). Soil-water-plant relationship. Plant Forms and functions, Growth, Development and Reproduction. Plant Propagation Methods. Cropping Systems, Planting Patterns and Plant Densities. Crop Husbandry, Pasture and Forage Crops. Floriculture, Weeds, Crop Diseases, Crop Pests, Forest management (Silviculture), Crop Improvement, Animal Production, Forms and classification of major farm animals in West Africa, General terminology in animal production, Anatomy and physiology of farm animals, Reproduction in farm animals, Animal Nutrition, Livestock Management, Animal Health, Fisheries and Wildlife, Bee-keeping (Apiculture), Animal Improvement.

AGG 112: Introduction to Agriculture II (1 Unit C: LH 15)

Learning Outcome

At the end of these lectures, students should be able to:

13. Explain the history of agricultural development and the role of the public and private sectors.
14. Identify and analyse the factors of agricultural production and the role of various resources
15. Explain constraints of technology and mechanization, and the role of agricultural extension transformation.

Course Contents

History of Agricultural Development in West Africa, Roles of Government and NGOs in Agricultural Development, Factors of agricultural production, Basic Economic Principles, Characteristic Features of Agricultural Production, Labour Management, Farm Management, Marketing of Agricultural Produce, Agricultural Extension, Agricultural Technology, Farm surveying and farmstead planning, Simple Farm Tools, Farm machinery and implements, Mechanization and sources of farm power, Processing and storage, Introduction to biotechnology, Application of ICT in agriculture, Introduction to agricultural research and statistics

BIO 101: General Biology I (2 Units C: LH 30)

Learning Outcomes

At the end of lectures, students should be able to:

1. explain cell structure and organizations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution and
6. enumerate habitat types and their characteristics.

Course Contents

Cell structure and organization, functions of cellular organelles, characteristics and classification of living things, chromosomes, genes and their relationships and importance, general reproduction, interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism); heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms), elements of ecology and types of habitats.

BIO 107: General Biology Practical (1 Unit C: PH 45)

Learning Outcomes

At the end of the lectures, students should be able to:

1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;

5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams;

Course Contents
Common laboratory hazards: prevention and first aid; measurements in biology; uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy, and proportion, use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101**

CHM 101: General Chemistry I (2 Units C: LH 30)

Learning Outcomes
At the end of the lectures, students should be able to:
1. define atom, molecules, and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. 4.justify the trends of atomic radii, ionisation energies, electronegativity of the elements based on their position in the periodic table;
5. 5.identify and balance oxidation–reduction equations and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridised orbitals;
7. identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure, and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy; and
10. determine rates of reactions and their dependence on concentration, time, and temperature.

Course Contents
Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence, forces, structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reactions, equilibrium, Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods and thermodynamics. Acids, bases, and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry Practical II (2 Units C: LH 30)

Learning Outcomes
At the end of this course, students will be able to:
1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;

3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements and
9. describe basic properties of transition metals.

Course Contents
Historical survey of the development and importance of organic chemistry; Fullerenes as fourth allotrope of carbon, uses as nano-tubules, nanostructures, nano-chemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanisms and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, students will be able to:
1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. 3.identify the basic glassware and equipment in the laboratory;
4. tell the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyze the data to arrive at scientific conclusions.

Course Contents
Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, students will be able to:
1. Identify the general laboratory rules and safety procedures
2. Collect scientific data and correctly carrying out chemical experiments
3. Identify the basic glassware and equipment in the laboratory
4. Identify and carryout the preliminary tests which includes ignition, boiling point, melting test on known and unknown organic compounds
5. Execute solubility tests on known and unknown organic samples
6. Execute elemental tests on known and unknown compounds and

7. Conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents
Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis volumetric methods

MTH 101: Elementary Mathematics I (Algebra and Trigonometry) (Units C: LH 30)

Learning Outcomes
At the end of the course students will be able to:
1. understand basic definition of set, subset, union, intersection, complements and use of venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. understand various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents
Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition, and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 units C: LH 30)

Learning Outcomes
At the end of this course, students should be able to:
1. understand types of rules in differentiation and integration;
2. understand the meaning of function of a real variable, graphs, limits, and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents
Function of a real variable, graphs, limits, and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; integration as an inverse of differentiation. Methods of integration, definite integrals. Application to areas and volumes.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes
On completion, the student will be able to:
1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems based on the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;

6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity;

Course Contents

Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton laws of motion (inertia frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes, and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits.

PHY 102: General Physics II (Electricity and Magnetism) (2 Units C: LH 30)

Learning outcomes

On completion the students should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of AC voltages and currents in resistors, capacitors, and inductors.

Course Contents

Forces in nature; electrostatics, electric charge and its properties, methods of charging, Coulomb's law and superposition, electric field and potential, Gauss's law, capacitance, electric dipoles, energy in electric fields, conductors and insulators, current, voltage and resistance, Ohm's law and analysis of DC circuits. Magnetic fields; Lorentz force, Biot-Savart and Ampère's laws, magnetic dipoles, dielectrics, energy in magnetic fields, electromotive force, electromagnetic induction, self and mutual inductances, Faraday and Lenz's laws. Step up and step down transformers: Maxwell's equations, electromagnetic oscillations and waves, AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

PHY 107/108: General Physics Practical I & II (1 Units C: PH 45)

Learning Outcomes
On completion, the student will be able to:
1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors; and
4. plot and analyse graphs, draw conclusions from numerical and graphical analysis of data.

Course Contents
This introductory course emphasizes quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

200 Level

GST 212: Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes
At the end of the lectures, students should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically assess the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge; and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents
Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 211: Entrepreneurship and Innovation (2 units C: 15: PH 45)

Learning outcomes
At the end of this course, students should be able to:

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking new value creation and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues, in Nigeria, Africa, and the rest of the World; and
8. state the basic principles of e-commerce.

Course Contents

Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

AGR 201: Principles of Crop Production (3 Units C: LH 45)

Learning Outcomes

At the end of the lectures, students should be able to:

1. basic agronomic terminologies;
2. knowledge of and basis of crop distribution across climatic regions;
3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification;
5. knowledge of soil management needs and some conservation practices;
6. enumerate the potentials of renewable natural resources;
7. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
8. establish small scale bee, snail, cane rat farms;
9. elucidate the importance of forestry and wildlife to the national economy; and
10. raise seedlings of economic tree species.

Course Contents

Definitions of the terms, crops and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or

grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.). Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies.
Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.
Renewable natural resources availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria. Silviculture, afforestation characteristics of major timbers and their uses. Forest production activities. Forest protection. Regulation of harvests for sustained yield. Importance of forestry and wildlife to the national economy. Practical approach to apiculture, snailery, cane rat farming and other forest enterprises.

AGR 202: Introduction to Agricultural Economics, Extension and Rural Sociology (3 units C: LH 45)

Learning Outcomes
At the end of the course students will be able to:
1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over;
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents
The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology. Importance of rural communities and institutions, social stratification, social processes, and

social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

AGR 204: Introduction to Animal Production, Fisheries and Aquaculture
(2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students are expected to have known the following:

1. prospects and problems of the animal industry;
2. identification/description of types of farm animals;
3. feeds and feeding management of farm animals;
4. housing and management systems of different livestock;
5. principles of animal health management;
6. animal breeding and breed improvement principles;
7. basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc).
8. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
9. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
10. describe linkages between fisheries and aquaculture;
11. explain the problems and principles of fisheries management and aquaculture;
12. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
13. situate and differentiate the various practices of fisheries management and different aquaculture practices;
14. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
15. understand the fundamentals of fisheries management in relation to over fishing and sustainable development; and
16. list the types of management tools.

Course Contents

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production, feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and rabbits). Introduction to game and companion animals. General principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation.
Anatomy and physiology of the cell, tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses, and other systems of farm animals.
Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection,

conservation, and sustainable harvest) and production. Ecological, economic, and cultural importance of fisheries park, zoo, sport fishing, marine park, etc. Scope of fisheries and aquaculture.

AGR 206: Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: LH 30)

Learning Outcomes

At the end of this course students should be able to:

1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;
8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

Course Contents

Philosophy, scope, objectives and historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post- harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food; factors contributing to texture, colour, aroma, and flavour of food. Cost, traditional and ethnic influence of food preparation and consumption pattern.

FAA 201: Entrepreneurship in Fisheries and Aquaculture (2 units C; LH 15: PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. understand the general concept of entrepreneurship, types and the rewards of being bearer of risk and uncertainty;
2. relate to the principal characteristics, profile, roles and function of an entrepreneurs;
3. develop ability to scan and identify entrepreneurial opportunities along the fisheries and aquaculture value chain;
4. identify entrepreneurial opportunities with industry which fisheries and aquaculture synergies with;
5. develop business plans including registration and linkage to financial institutions; and
6. acquire the spirit of entrepreneurship towards economic development of Nigeria.

Course Contents
Concept of Entrepreneur as relates to risk taking. Characteristics of Entrepreneurs. Profile of an Entrepreneur. Circumstances favouring entrepreneurship in fisheries and aquaculture. Opportunities in the fisheries and aquaculture value chain. Opportunities on industry which fisheries and aquaculture impact or synergize with. Sources of credit to support entrepreneurial activities in the fisheries and aquaculture industry. Guidelines towards registration of businesses in fisheries and aquaculture.

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. analyse the concept of peace, conflict and security;
2. List major forms, types and root causes of conflicts and violence ;
3. Differentiate between conflict and terrorism, enumerate security peace building strategies; and
4. Describe roles of international organization, media and traditional institutions in peace building.

Course Contents
Concept of peace, conflict and security in multi- ethnic., Types and theories of conflicts; ethnic, religious, and economic. Goe-political conflicts; structural conflicts theory, realist theory of conflict, frustration- aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settler's phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes and rivalries. Economic inequalities, social disputes, nationality movements and agitations. Selected case studies – Tiv-Junkun, Zango-Kartaf, chieftaincy and land disputes etc. Peace building, management of disputes and security. Peace and human development. Approaches to peace and conflict management (religious, government, community leader etc). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales, constructive and destructive. Justice and legal framework, concepts of social justice. The Nigeria legal System. Insurgency and terrorism. Peace mediation and peace keeping. Peace Security Council (international, national and locals levels). Agents of conflict resolutions conventions, treaties, community policing, evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration (c) negotiation (d) collaboration, etc. Roles of International Organizations in conflict resolution (a) The United Nations, UN and its conflicts resolution organs (B) The African Union & Peace Security Council (C) ECOWAS in peace keeping, Managing post-conflict situations/crisis refugees. Internally displaced persons, IDPs. The role of NGOs in post–conflict situation/crisis.

ENT 312: Venture Creation (2 Units C: LH 15: PH 45)

Learning Outcomes
At the end of the lectures, students should be able to:
1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;

3. state how original products, ideas and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finances;
6. implements the requirements for establishing and managing micro and small enterprises; conduct entrepreneurial marketing and e-commerce;
7. apply a wide variety of emerging technological solutions to entrepreneurship; and
8. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (Sources of business opportunities in Nigeria, environmental scanning ,demand and supply gap/unmet needs /market research , untilised resoyrces, social and climate conditions and technology adoption gap) New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition).Entrepreneurial markeing and e-commerce (Principles of markeing, customer acquisition and retention,B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies). Small business management /family business ; leadership and management , basic bookkeeping , nature of family business and family business growth model. Negotiation and business communication(strategy)and tacts of business negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea presentations, business idea contest, brainstoming sessions, idea pitching). Technological solutions (the concept of market /customer solution, customer solution and emerging technologies, business applications of the new technologies – Artificial Intelligence (AI), Virtual mixed Reality (VR) Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy, etc. Digital business and e-commerce strategies)

FAA 301: Fisheries Biology (2 units C: LH 15: PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. apply various concepts in the course as tools for management of commercial fisheries and the science of fisheries management;
2. recongnise the concept and tools of age determination in vertebrate and invertebrate fishes such as bony fishes;
3. explain the use of biological parameters in relations to fisheries management
4. understand the relevance of the von Bertalanffy growth;
5. apply equation function as an important tool in the management of fisheries resources;
6. understand the use of graphical and computer-based analyses of growth in invertebrates and vertebrates;
7. differentiate between and use of age/length-based catch curves; and
8. understand the effects of fishing on target fish and non-target fish species, and environment and ecosystems.

Course Contents

Size distribution, length and weight measurements and distribution. Age determination. Relationships of growth variables/parameters especially in relations to length frequency and hard structure. Stock structures and abundance. Fishers and fishing gears. Factors that

increase and/or decrease biomass. Definition and derivation of Von Bertalanffy growth equation. Food and feeding habits and methods of estimation. Fish reproduction, spawning ratio and sex determination. Exploited invertebrate and vertebrate species.

FAA 302: Fish Nutrition (2 units C: LH 15: PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. grasp the basic principles in fish nutrition;
2. describe the differences in fish nutrition in relation to human and other animals;
3. situate the increasing sensitivity of aquaculture feeds to the aquatic environment;
4. expose to the importance of classes of nutrient to fish diet, health and growth;
5. grasp the relevance of optimum fish nutrients for efficiency of aquaculture;
6. production and fish feeding practice to avoid over feeding in terms of nutrient and economic losses; and
7. gain knowledge of the balance among dietary energy intake, expenditure, and simple way of looking at dietary component utilization by fish.

Course Contents

Principles of fish nutrition. Food classes, chemistry and nutritive value of various classes of fish feeds. Nutrient requirements of cultivable fish and shellfish. Description of fish growth and important nutrients required for fish growth. Nutrient sources and practices consideration in fish feeding. Fish feed formulation and utilization. General methods of feeding fish. Bioenergetics. Nutrition and fish health and fish feeding.

FAA 303: Ichthyology (Systematics of Fish) (2 units C: LH 15: PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. recognise the concept of species as the necessary and sufficient conditions for a particular taxon to be recognized as a distinct species;
2. explain the concept of fish diversity from point of view of fish evolution over time;
3. describe the traditional and modern dichotomous keys such as the IPez (morphometric software), Integrated Photo-based Online Fish-Identification System (IPOFIS) exemplifying Interactive Electronic Keys (IEKs);
4. discuss the ideas and principles underlying modern biological classification and its application to living fish groups; and
5. describe and draw pattern of phylogenetic relationship, major features of existing fish diversity (such as number of species, main lineages), its evolution (such as timing), geographic distribution and classification.

Course Contents

The diversity of fishes. Principles of fish systematics. Taxonomy and detailed study of principal commercial species of Nigeria's fresh, inland, estuaries and ocean water, invertebrates and reptiles. Identification of species using dichotomous keys and monographs. Important world species such as sardine, tuna, anchovies etc. Biological attributes of fish populations. Biogeography of fishes and phylogenetic relationships.

FAA 304: Fish Gear Design and Production (2 units C: LH 15: PH 45)

Learning Outcomes
At the end of the course, the students should be able to:

1. know the rational classification system for the multitude of fish gear and craft techniques used today;
2. acquire increasing knowledge of fishing gears and the basic operation of different methods of fishing in relation to future management strategies for effective and sustainable fisheries;
3. explain developments of fishing and the fishing gear industry, fisheries and gear technology in Nigeria, different fishing methods and techniques in the world;
4. explain fully with the concept behind the theoretical and applied/practical aspects of fish gear and craft design and construction;
5. acquire the basic knowledge on research on selectivity and its importance for the further development of technical measures towards sustainable fisheries harvest practices;
6. apply the principles of fish behaviour to the design and construction of fishing gear for the target species and reduction of bye catches; and
7. discuss the potential as well as limitations of acoustic tools and how they are used both in commercial fishing and research.

Course Contents
Types of fishing gears and crafts techniques. Theory and practical steps in fish gear and craft design, and construction. Fishing gears and crafts gear selectivity. Properties of the materials used in the construction of fish gears. The design and construction of different types of gears and craft. Assessment of fishing gear efficiency. Fisheries Acoustics and Fish behaviour. Potential and limitations of acoustics tools and importance in commercial fishing as well as research Repair and maintenance of fishing gears and crafts.

FAA 305: Limnology (2 Units C: LH 15: PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. describe aquatic system investigation and relevance in the theory and practice of fisheries science, management and governance;
2. understand the distribution and dynamics of water bodies;
3. acquire knowledge of the classification and general characteristics of lotic and lentic water bodies;
4. learn and integrate multi-disciplinary concepts to understand how aquatic systems function;
5. identify common aquatic organisms, particularly algae, zooplankton, and macroinvertebrates; collect, analyse, interpret, and report limnological data; and
6. gain hands-on field and laboratory experience sampling aquatic systems, measuring and interpreting important limnological variables, and identifying aquatic organisms during the laboratory portion of the course.

Course Contents
Significance of limnological studies. Hydrology and water cycle. Physical and chemical properties of inland water. Properties of natural and man-made lakes. Thermal properties and

stratification. Factors regulating productivity in the aquatic ecosystems. Estimation of dissolved anions, cations. Properties of natural and man-made lakes. Water movement. Primary production. Pollution studies and evaluation. Estimation of trace elements.

FAA 306: Fisheries Ecology (2 Units C: LH 15: PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. understand the major ecosystem types that occur in terrestrial, marine, and freshwater environments and explain how organisms are physiologically and behaviourally adapted to these environments;
2. describe the biotic and abiotic factors that place limits on a species' distribution and abundance;
3. gain improved understanding of various categories of species interactions and explain how these interactions influence species' distribution and abundance; and
4. describe the ecology system of local fisheries and different biomes of aquatic systems of Nigeria.

Course Contents

Principles of ecology. Ecological processes and fish diversity and abundance. Aquatic production and its regulatory factors. Food chain and web, reproductive behaviour of life cycles of some selected species Food and feeding habit of fish food and habitat selection, population, niche concept. Flora and fauna; utilization and management. Ecology of plankton and generation of nutrients. Feeding, reproductive, aggressive, predatory and migratory behaviours in selected fish species. Organic production in aquatic fauna and flora-algal blooms and eutrophication, plankton, and benthos, biomass assessment, Ecology of freshwater, estuarine and marine systems of Nigeria.

FAA 307: Principles of Aquaculture (2 Units C: LH 15: PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. discuss the historical background and development of the aquaculture in Nigeria;
2. describe the various aquaculture practices and operations in aquaculture of fishes;
3. explain the importance of careful evaluation of feeding, water and relevance to good fish production; and
4. recognise that different types of aquatic resources help evaluate different options and choice in aquaculture.

Course Contents

History, present organisation and status of aquaculture in Nigeria. Types of aquaculture. Principle of aquaculture operations, liming, fertilisation; weeding (control methods: chemical, mechanical and biological methods) feeding and harvesting. Selection and stocking of culture species. Introduction of exotic species and their implications. Water requirements and budget. Fish farm design. Economic consideration of aquaculture.

FAA 308: Fisheries Stock Assessment (2 Units C; LH 15: PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. use appropriate quantitative methods in analysing data collected from fisheries;
2. estimate vital parameters (such as, size, density, growth, recruitment, and mortality) for fisheries;
3. conduct different sampling methods in fish stock including Monte Carlo methods: bootstrap and jackknife;
4. quantitatively evaluate current status of a fishery and alternative management strategies through formal stock assessment process; and
5. use sampling techniques in the study of mixed or multi-species and multi-gear fisheries.

Course Contents
Fish population dynamics and stock assessment. Concept of population and unit stock. Characteristics of mixed stock / multi-species. Principles, sampling and data requirement of stock assessment. Methods of stock management in fisheries. Capture- Recapture techniques, tagging and marking. Age group and year class determination. Catch per unit effort method. Practical evaluation of fisheries resources of selected project areas. Echo method in stock assessment.

FAA 399: Industrial Atachment, Seminar and Report Writing (6 Units C: PH 270)

Learning Outcomes
At the end of the lectures, students should be able to develop:
1. skills of technical writing;
2. logical presentation of facts and figures; and
3. skills of observation and reporting.

Course Contents
A report of all activities carried out during the practical year, including field visits and farm activities is required.

400 Level

FAA 401: Fish Processing, Handling, Utilization Technology, storage and Control (2 Units C: LH 15: PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. understand fish and fisheries products as highly perishable food;
2. explain how the physical and chemical characteristics drive spoilage and hazards in fish as food;
3. state the different sources of fish spoilage especially due to handling;
4. understand the different hazards and safety issues in fish and fisheries products;
5. use different technical and non-technical methods to control hazards and ensure food safety in fish and fisheries products.
6. operate to traditional and modern processing facilities and equipment;

7. perform fish smoking using the various additives for processing fish;
8. carry out washing, degutting and salting of fish towards fish smoking; and
9. identify the differences between sun-drying, solar drier and fish smoking technologies

Course Contents

Fish quality, intrinsic factors, deterioration and defects. The biodegradation and biodeterioration of fin and shell fish, spoilage indices. Methods for evaluating fish quality and spoilage: sensory, chemical, biochemical and microbiological methods of assessment. Fish handling, storage and transportation. Traditional and modern methods: filleting mincing flaking, marinating canning, drying smoking, etc. Hazards and fish safety. Quality control and evaluation methods.

Principles and methods of preservation. Packaging. Mechanism of transportation of live fish specimens. Methods of improving fish processing and utilization, fish transportation; techniques quality control and new products development. Construction of traditional (clay kiln) and modern (metal kilns) preservation techniques. Methods of estimating nutrients in fish flesh. Removal of parasites and pathogens from fish. Organoleptic assessment of quality of fin and shell fish. Feed formulation and other fish utilization. Maintenance of machines used in processing and storage.

FAA 403: Fish Gear Design, Production, Use, & Maintenance; Pond Construction & Management (2 Units C; LH 15: PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. visit a fishing community and acquire fishing skills;
2. familiarise with the fishing communities and dexterity of the fishers;
3. gain a first-hand knowledge of the skills in fish net repair, knotting, etc;
4. help practically in the repair of boats and available fishing crafts; and
5. experience the surreal life of fishing and being a fisher.
6. recognise the different types of ponds aside the earthen and concrete tanks as may be available in different farms;
7. understand the various methods of ponds maintenance and repair techniques; and
8. know other types of water-holding structures outside the conventional types such as earthen ponds, concrete tanks, vat and other new local inventions.

Course Contents

Visit to typical fishing community to learn from setting, governance systems, fishing trips, preparation for setting and arriving from fishing adventure, net making, beach-siene, boat building, trawler rigging and studies of efficiency of gear, fishing net and craft maintenance.

Pond survey, pond engineering and construction. Term used to describe parts of the pond.

Pond construction tools and equipment. Pond maintenance requirements. Management of pond structures. Exposure to different water-holding structures for raising fish and shell-fish.

FAA 404: Fish Fry and Fingerlings production; (Hatchery management; Fish production and Management and Fish Food Nutrition and Fish Food Technology) (2 Units C; LH 15: PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. demonstrate and explain hatchery management practices as obtained on the fish farm;
2. supervise the production of fries and management of fingerlings;
3. identify the feed sizes that are given to the fish fries as they grow and different cares to be given to the fries;
4. understand enhancement of fish growth to its maximum size through appropriate stocking rate, feeding regimes etc;
5. understand the pros and cons of rights-based fisheries management principle especially in the management of tropical fisheries;
6. understand various feed stuffs used in aqua-feed and their nutrient composition and how fish farmers make substitutions;
7. analyze and identify feed stuffs into different nutrient groups based on hand-on experience;
8. states the chemical compositions of various feed stuffs and supplements;
9. use different local ingredients in formulating fish feed based on nutrient requirements and available nutrient sources; and
10. identify the components and demonstrate the necessary skills in operating feed mill, pelleting machines.

Course Contents

Maintenance of hatcheries and nursery ponds, constant supply of quality water, quarantine, segregation and matching of brooders. Spawning techniques: Induced breeding, artificial and natural sex-reversal, hybridisation.

Practical aspects of fish breeding techniques in cross breeding for stock improvement. Induced breeding, hypophysations techniques. Use of HCG, fish pituitary and other hormones in induced breeding. Appraisal of management structure and effectiveness of fisheries management policies. Record keeping and accounting procedures in fish farms.

Nutrient requirement of fish, factors affecting nutrient requirement of fish, chemistry and nutritive value of materials used in fish feed production. Fish feed formulation. Methods of feeding fish. Development of various fish products, economic values of fish products and their implications

FAA 405: Fish Marketing and Marketing Management , Accounting Practices and Economics. (2 Units C; LH 15: PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. explain the concept of marketing as integral process of all branches of fishery and aquaculture production efforts;
2. explain marketing as precursor of production efforts;
3. discuss marketing concepts such as needs and wants as the basis for marketing plan;
4. analyse consumer behaviour and delivered tailored products to meet their satisfaction;

5. understand applications of marketing knowledge as essential to avoid fish and fishery product rejection and hence products failure; and
6. develop marketing skills to achieve success with products and services at industry, entrepreneurial and consultancy service.
7. emphasise the various accounting practices and books the farm needs to keep; and
8. create forms to keep all forms of records: production and financial records.
9. understand bio-economics, economic models and biological models in fisheries;
10. explain the appropriateness of economic models and their application;
11. explain the issue of property ownership as a basis for fisheries management and fisheries economics; and,
12. apply fisheries economic concept in decision making.

Course Contents

Introduction to marketing. General concepts in marketing fish and fishery products. Marketing Management. Core Marketing Concepts: Market Structure, Functions and Types. Marketing Channels and Supply Chain. Marketing Margins and Strategies. Fish Product Development and Product Mix. Consumer Behaviour and Marketing Research. Cold Storage and other Marketing Infrastructure in Nigeria. Export Markets and Marketing of Fish And Fishery Products.

Practical aspects of fish breeding techniques in cross breeding for stock improvement. Induced breeding, hypophysations techniques. Use of HCG, fish pituitary and other hormones in induced breeding. Appraisal of management structure and effectiveness of fisheries management policies. Record keeping and accounting procedures in fish farms.

Fisheries and Economic Sciences: What is Economics all about? Types of tenureship in fisheries. Open Access Fisheries and its economic challenges. Basic fisheries bio-economics models: The Gordon Schaefer Model; A basic age-structured Model; Management reference points; The main economic problem of fisheries management: overexploitation and rent dissipation. sustainable yield curve and total revenue curve; bioeconomics equilibrium, factor rents, welfare economic theory and its relevance for fisheries; externalities in fisheries; capital investments and consumption patterns,. Working with data and simulations in fisheries models. Rights-based fisheries. Simulating effects of ITQ.

FAA 407: Aquatic Environment survey; climate change in fisheries and aquaculture (2 Units C; LH 15: PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. describe the surrounding local aquatic environment especially where the institution is located;
2. analyze fishing ground and challenges of fisheries within a common pool resource;
3. discuss the menace of aquatic weed within littoral states in Nigeria;
4. evaluate scientic programmes;
5. explain the status of fish and shell fish stock;
6. assist with sustainable management of our aquatic systems and resources;
7. gain deeper knowledge of course such as fisheries biology, fisheries stock assessment and genera data collection;
8. gain a real-world understanding of global phenomenon and its application to fisheries and aquaculture;

9. situate changes in fisheries stock and aquaculture practices within the concept of climate change;
10. gain an understanding of the perspectives of climate change in terms of drivers of climate change;
11. discuss the impact of climate change on fisheries and aquaculture;
12. understand the key instruments and policies used to tackle climate change; and
13. acquire considerable knowledge on climate change and fisheries development in Nigeria.

Course Contents

Visual survey (reconnaissance) purpose, location, water parameters, geology, metrology, surveying (leveling or topographic surveying instrument and their maintenance. Record keeping. Visual understanding of the aquatic resources and path ways in the local community of the university, description of the various water resources and underlined differences and the fisheries they support.

Understanding climate change. Key issues and concepts around climate change: greenhouse gases and effects, mitigation, impact, adaptation, risk, disaster, vulnerability, resilience. Climate change scenarios: past, present and future, both global and Nigeria perspectives; uncertainties in climate change model projections. Climate Anomalies: El Nino, La Nina and the Southern Oscillation (ENSO), North Atlantic Oscillation (NAO), Pacific Decadal Oscillation (PDO), Indian Ocean Dipole (IOD). Vulnerability of Climate Change to Fisheries and Aquaculture Globally and Nigeria. Projected changes to global fisheries and aquaculture. Adaptation, resilience and disaster risk reduction to climate change: Habitats and dependent people: community-based adaption, ecosystem-based adaption especially use of aquatic biodiversity for adaption, engineering based solutions, grey-green approach, climate proofing. Incremental and transformational adaptation. Climate change mitigation: global, regional and national levels Agreements, legislations and policies to tackle climate change: Paris agreement, IPCC, COP, SDG goal 17, BCCSAP, NAPA, NAP, National communication to adaptation, NDC, loss and damage.

FAA 410: Information and Communications Technologies in Fisheries and Aquaculture (2 Units C; LH 15: PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. discuss the roles and benefits of application of ICT to fisheries and aquaculture;
2. explain the use of Apps in fisheries and aquaculture especially the FAO applications;
3. acquire skills and exposure to development of software and apps for fisheries and aquaculture operations and management;
4. discuss the use of artificial intelligence in fisheries and aquaculture and as an emerging opportunity for entrepreneurial engagements after graduation;
5. gain exposure to concept of value chain in fisheries and aquaculture;
6. discuss the various methodologies in value chain study;
7. acquire skills in value chain analysis and fisheries product development;
8. understand the importance of value chain development two small scale sectors in fisheries and aquaculture; and
9. develop skills in value chain analysis through functional, environmental, social and economic analysis.

Course Contents
Appreciation of ICT in Fisheries and Aquaculture. Common Computer Application in Fisheries and Aquaculture especially the FAO applications. Development of Applications in solving problem of Fisheries and Aquaculture. Application of ICT in Fisheries and Aquaculture. Hardware and Software in Fisheries and Aquaculture. Artificial Intelligence Application in Fisheries and Aquaculture. Machine Learning.
Introduction and definition of value chain, types of value chain methodologies. Sustainable value chain methodology. Value chain mapping. Value chain analysis and importance to small scale fisheries and aquaculture sectors. Quantitative methods in data gathering for value chain analysis. Sustainable pathways in value chain in fisheries and aquaculture

FAA 499: Project and Seminar (4 Units C; PH 180)
Each student is expected to choose and execute a special project under a supervisor. Duration of the project is 2 semesters.

Learning Outcomes
At the end of this course, students should be able to:
1. demonstrate that they have acquired relevant expertise to conduct research or produce some other form of creative work;
2. demonstrate mastery of subject material from literature relevant to their thesis topic;
3. develop working relationship with superior/supervisors while demonstrating the required independence to own their research/ creative work;
4. conduct scholarly or professional activities in an ethical manner within the limit of using referenced materials;
5. produce a well written thesis that places the work in proper context and use correct style and grammar to effectively communicate major findings;
6. demonstrate the capacity to deliver a well-organized and easy to follow defense seminar;
7. display the strategies for good oral communication during the project defence with their committee; and
8. display evidence of critical thinking skills during the oral project defense.

Course Contents
Each student is required to choose and execute a special project under a supervisor. Duration of the project is a minimum of two semesters. Typed and bound project reports to be submitted at the end of project while the student is to face a project defence in an oral examination of his project.

Minimum Academic Standards

Laboratory Requirements for Fisheries and Aquaculture
Category A
1. Photometers
2. Amino acid analyser
3. Atomic absorption spectrophotometer
4. 20 units of desktop computers for teaching purposes
5. Incubator/Hatcher
6. Electron microscope

Category B

1. Audio-visual aids
2. Non-refrigerated centrifuges (table-top) for 15 and 50 ml conicals
3. Refrigerated centrifuges (table top) for 15 and 50 ml conicals
4. Colorimeters
5. Spectrometers
6. Bench-top Incubators
7. Transfer chamber
8. Lamina Flow Chamber
9. Gas chromatography coupled with mass spectrometer (GCMS)
10. Gas chromatography coupled with electroantenogram
11. Leaf area meter
12. Plant samples grinding machine (with stainless metal)

Category C

1. 10-15 Microscopes (for large classes)
2. Weighing balances as appropriate for the Department
3. Moisture meters
4. Water baths
5. Deep freezers
6. Refrigerators
7. Desk top computers and necessary software
8. pH-meter w/articulated arm
9. Fume cupboard
10. Test-tube shaker
11. Light meter
12. Spectrophotometer
13. Water distiller
14. Centrifuge
15. Microscope with camera
16. Mettler balance
17. Triple beam Balance
18. Slide projector
19. Digital Thermometer
20. Magnetic Stirrer

Category D

1. Ovens
2. Autoclave
3. Distillation unit
4. Gas chamber
5. Digestion unit
6. Extraction unit
7. Ashing equipment (Furnace)
8. pH meters
9. Flame photometer
10. Water activity meters

11. Bante 900 bench top multiparameter water quality meter (pH, ion, conductivity, TDS, salinity, resistivity, ORP)

Category E

1. ½ Hectare size fish farm
2. Fishing Boats
3. Water quality laboratory
4. Smoking kilns
5. Feed pelleting machines
6. Nets
7. Traps
8. Fish canning machine
9. Aquaria
10. Concrete tanks
11. Glass tanks
12. Fish hatcher
13. 10,000 fishes
14. Vats (ponds constructed from wooden material and tapolin)
15. Research boat: Research boat is required for courses related to fisheries ecology, ichytology, limnology, aquatic survey, students' projects, fish trips, fisheries stock assessment

Other Equipment

Vehicles

At least 1 pick-up van, 1 saloon car for the HOD

Culture Rooms

Culture rooms would be needed for pathological work.

Sheds

Sheds are required for major repairs and servicing of farm equipment as well as their storage.

Cold Rooms

Teaching/Research Farm

Staffing

Academic staff

The NUC guidelines on staff/student ratio of 1:15 for Departments in Agriculture discipline shall apply. However, there should be a minimum of six full-time equivalent of Staff in the department. There is need to have a reasonable number of Staff with doctoral degrees as well as sufficient industrial/practical experience. With a minimum load of 18 Units per semester for students and a minimum of six full-time equivalent of staff in each programme. Staff should have a maximum of 15 contact hours per week for lectures, tutorials, practical and supervision of projects.

In each department, the academic staff number should be as per the National Universities Commission guidelines. The academic staff pyramid should be composed as follows: -

1. Professor/Reader - 20%
2. Senior Lecturer - 35%
3. Lecturer 1 and below - 45%

Technical support personnel

The services of technical support staff, which are indispensable in the proper running of laboratories and workshop / studios are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance. The minimum of academic staff to technical staff ratio of 5:1 should be maintained.

Library

There must be adequate library facilities to cater for the needs of staff and students in all the programmes in the college/faculty. These include current journals, handbooks, textbooks, manuals, codes of practice, standards and specifications etc. in sufficient numbers. Most importantly, there shall be provision for ICT-based access to electronic resources and the information super highway.

Classroom, Laboratories, Workshops and Offices

The NUC recommends the following physical space requirement:

		m^2
Professor's Office	-	18.50
Head of Department's Office	-	18.50
Tutorial Teaching Staff's Office	-	13.50
Other Teaching Staff Space	-	7.00
Technical Staff Space	-	7.00
Secretarial Space	-	7.00
Academic Staff Research Laboratory	-	16.50
Seminar Space/per student	-	1.85
Laboratory Space	-	7.50.

B.SC/B.Tech Food Science and Technology

Overview

Food Science and Technology is the application of engineering, biological, and physical sciences to study the nature of foods, the causes of deterioration, the principles underlying food processing, and the improvement of foods for the consuming public. Food technology on the other hand is the application of food science to the selection, preservation, processing, packaging, distribution, and use of safe food. Related fields include analytical chemistry, biotechnology, engineering, nutrition, quality control, and food safety management. The Food Scientist helps supply this bounty by learning to apply a wide range of scientific knowledge to maintain a high quality, abundant food supply. Food Science allows us to make the best use of our food resources and minimise waste.

The underlying aims of the programme of Food Science and Technology are to achieve the goals and objectives of the National Policy on Agriculture. This is in furtherance of Nigeria's renewed commitment for food sufficiency and general self-reliance through the turning out of graduates that are adequately equipped with the comprehensive theoretical knowledge and practical skills required for meaningful engagement in Food Science and Technology, thus, making them self- reliant and valuable to the industry and society in general. The degree will be Bachelor of Science or Bachelor of Technology in Food Science and Technology (B.Sc or B. Tech. Food Science and Technology).

Philosophy

The philosophy of the programme is to produce well-trained Food Scientists and Technologists, capable of working in existing food industries, using locally available raw materials.
The graduates of the programme will be capable of setting up cottage food processing industries (to reduce post-harvest food losses) as well as making nutritious and wholesome food available to consumers particularly in Nigeria and West African sub region.

Objectives

The objectives of the programme are in tandem with the national needs and priorities in the food sector. Therefore, graduates of the discipline are expected to be resourceful, creative and knowledgeable, towards solving relevant societal problems.
The specific objectives of the programme are to:

1. train skilled technical and managerial manpower for agro-allied industries;
2. produce graduates that can establish, manage and direct small scale food processing and allied industries using locally available raw materials;
3. produce qualified personnel that will be involved in consultancy services in food product development, R&D, food processing and preservation, which will reduce post-harvest food losses and produce job-creator graduates rather than job seekers;
4. equip graduates with knowledge of design and fabrication of food processing equipment, thereby assisting to develop traditional technology;
5. equip graduates with knowledge and skill required to pursue postgraduate studies in food science and technology and to teach food science and technology and allied courses in appropriate institutions of higher learning;

6. assist the nation in its efforts to achieve self-sufficiency in the production of basic food and agricultural raw materials needed for industrialisation;
7. modernise agricultural production, processing, storage, preservation and distribution;
8. enhance employment opportunities and attendant improvement in the quality of rural life;
9. ensure that graduates exercise original thought, with sound professional judgment, regarding the establishing their own small scale or medium scale enterprises as a profitable business; and
10. produce adequate manpower that will engage optimally in direct research, in all aspects of food science and technology.

Employability skills

Programmes in Bachelor of Science or Bachelor of Technology (B.Sc or B.Tech.) Food Science and Technology are designed to meet advanced training in all aspects of food, viz: processing, chemistry, microbiology, engineering, quality control, etc. Thus, food scientists and food technologists are adequately groomed to:

1. work as production, quality assurance/control managers in food processing industries.
2. work in food industries as research and development officers where they will be involved in new product development and perfecting methods of processing food which will reduce post-harvest food losses and produce job creator graduates rather than job seekers,
3. serve as consultants in charge of evaluating food processing plants and recommending modifications to ensure good manufacturing practices.
4. create job opportunities for the unemployed through cottage food processing establishments.
5. work with the Food and Agricultural Organization (FAO) of the United Nations
6. work as inspection officer in National Agency for Food, Drugs and Administration Control (NAFDAC), Standard Organisation of Nigeria (SON), etc. and other related organizations,
7. work in the design and construction of food processing equipment; and
8. teach in reputable institutions of higher learning.

21st Century skills

The programme in Food Science and Technology would inculcate in graduates contemporary agricultural-related techniques, which would enable them understand, the science of food processing, preservation, storage and marketing and the inter-related factors which drives productivity and efficiency in the sector and how they affect the sectoral performance especially in Nigeria. Specifically, the programmes are collectively designed to: inculcate in the students these 21st century skills:

1. Critical thinking,
2. Creativity
3. Collaboration
4. Communication
5. Information literacy
6. Media literacy
7. Technology literacy
8. Flexibility
9. Leadership
10. Initiative

11. Productivity
12. Social skills

Specifically, the curriculum will produce graduates who will be skilled in bringing innovations to food science and technology in Nigeria through research as follows:

1. create awareness and understanding of the need to develop the soft skills (communication, leadership, team spirit, inter-personal, etc), required to maximize the benefits of food science and technology,
2. build in graduates of the discipline, the capacity to solve food science and technology-related problems as experts for the overall benefit of the society; and
3. inculcate in graduates, the right mindset with the right attitude towards accepting to be key players in food science and technology.
4. develop the food sector skills that are available in food science and technology discipline which are:
    a. skills for food quality & food safety: quality management, quality assurance & quality control, food safety management, food hygiene & food safety control, food fegislation & control
    b. skills for research & revelopment: product development, research, consumer & nutritional science
    c. skills for food production & manufacturing: dngineering maintenance, health, safety & the environment, production management, production operations, cleaning & preparation, control operations
    d. skills for food retail & the supply chain: supply to production, food service, health & nutrition skills for logistics, transportation
    e. skills for food processing sectors: meat & poultry processing —production butcher, winemaking
5. emphasis five main priorities in the 21st century skills which are:
    a. product development,
    b. food legislation & control and food safety management,
    c. food hygiene & food safety control
    d. quality management, quality assurance & quality control and
    e. research

6. University education should now be geared toward Education 5.0 instead of Education 3.0. Education 5.0 are now involved in (1) teaching, (2) research (3) community service (4) innovation and (5) industrialisation.

Unique features of the programme

1. Food science as a discipline is not the same as the science of food or cooking.
2. Food Scientists and Food Technologists study the physical, microbiological, and chemical makeup of food depending on their area of specialisation,
3. Food Scientists develop ways to process, preserve, package, or store food, according to industry and government specifications and regulations in order to deliver tasty, nutritious, safe, and convenient foods.
4. The technologies used after the point of harvesting of crops until the point of consumption belong to food technology.
5. Some of the technologies used in food preservation are sterilization, pasteurization, packaging, chilling, freezing and dehydration.

6. Some of them are analytical, separation, vacuum packaging and modified atmospheric techniques.
7. At the end of their training, our students must have undertaken training in the following areas: food processing and preservation, food microbiology, food chemistry, food quality control, food engineering, food product development, food packaging, post-harvest and storage technology, human nutrition and food biotechnology.
8. The programme is under the professional body of the Nigerian Chartered Institute of Food Science and Technology.

Admission and Graduation Requirements
Admission requirements

UTME- Five Year Degree Programme
Candidates seeking admission into the five-year programme in Food Science and Technology should possess Senior School Certificate (SSC) credit passes in the following five subjects: English Language, Mathematics, Chemistry, Physics, Biology or Agricultural Science, at not more than two sittings. In addition, applicants must obtain an acceptable pass in the Unified Tertiary Matriculation Examination (UTME).

Direct Entry Mode
Applicants seeking admission into 200 level of the programme should possess in addition to the SSC requirements for UTME as stated above,

1. National Diploma in Food Science and Technology with a minimum of not below Lower Credit or its equivalent from a recognised institution; or
2. Advanced Level credit pass in any two of Chemistry, Physics or Mathematics and Biology or Agricultural Science.

Graduation requirements
To be eligible for the award of B.Sc or B. Tech. in Food Science and Technology, a student must have:

1. passed all core courses as well as university and school-required courses and electives recommended for specialisation;
2. passed a minimum of 150 or 120 credit units required for graduation in a 5-year (UTME) or 4-year (Direct entry) programme respectively,
3. successfully completed all class work, industrial attachments, seminars and projects.
4. Direct entry students are expected to audit and pass the University required courses that should have been taken at the100L which may be peculiar to each university.
5. In case they fail any of the audited courses, the students must offer them formally as credit courses.
6. All 100 level courses must be in tandem with the CCMAS to give all students, irrespective of their respective programmes, a solid foundation;
7. The Common Courses from the Sciences and GST would be taken at 100 Level while the ones peculiar to Food Science and Technology would be taken at 200 Level. Programme specific courses would commence fully from 300 level;
8. The minimum credit load per semester is 15 while the maximum is 24. However, universities are advised to implement the CCMAS in such a way that will accommodate carry over courses in line with the element of the course credit system.

9. The reduction of the credit load for GST and ENT courses to a maximum of 12.
10. The minimum academic standards on the Mode of Programme Delivery which would involve a blend of face to face contact and online learning as well as capstone approach and case studies, etc; and
11. The Grading System is a 5-point Grading System where 40 % score is E and CGPA of 1.00 at the point of graduation is classified as Pass.
12. The Bachelor of Science or Bachelor of Technology programme in Food Science and Technology runs normally for 10 semesters for UTME candidates and 8 semesters for direct entry candidates. However, a student who fails to graduate within the normal number of semesters will not be allowed to exceed a total of 15 semesters in the case of UTME candidates and 12 for direct entry students.

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course code	Course title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	15	45
AGR 201	Principles of Agronomy	3	C	45	-
AGR 203	Introduction to Forest Resources and Wildlife Management	2	C	30	-
AGR 205	Introduction to Fisheries and Aquaculture	3	C	45	-
AGR 202	Introduction to Agricultural Economics, Extension and Rural Sociology	2	C	30	-
AGR 204	Introduction to Animal Production	2	C	30	-

AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
FST 201	Principles of Food Processing and Preservation	2	C	30	-
	Total	**20**			

300 Level

Course codes	**Course title**	**Units**	**Status**	**LH**	**PH**
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
FST 301	Food Microbiology	3	C	30	45
FST 302	Basic Food Chemistry	3	C	30	45
FST 303	Food Process Engineering	3	C	30	45
FST 304	Principles of Food Analysis	3	C	30	45
FST 305	Principles of Sensory evaluation	2	C	30	-
FST 306	Unit Operations in Food Processing	2	C	15	45
	Total	**20**			

400 Level

Course codes	**Course title**	**Units**	**Status**	**LH**	**PH**
FST 401	Food Quality Control & Plant Sanitation	3	C	30	45
FST 402	Industry-based Supervisor's Assessment (SIWES)	4	C	-	180
FST 403	Fruits and Vegetables Technology	3	C	30	45
FST 404	University based Supervisor's Assessment (SIWES)	4	C	-	180
FST 405	Students Reports and Practical Presentation (SIWES)	4	C	-	180
	Total	**18**			

500 Level

Course codes	**Course title**	**Units**	**Status**	**LH**	**PH**
FST 501	Cereals and Tubers Technology	3	C	30	45
FST 502	Meat Science & Fish Science & Technology	3	C	30	45
FST 503	Fats and Oils technology	3	C	30	45
FST 504	Milk and Dairy Technology	3	C	30	45
FST 505	Food Products Development	3	C	30	45
FST 598	Seminar	2	C	-	-
FST 599	Research Project	4	C	-	180
	Total	**21**			

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units; C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. identify possible sound patterns in English Language;
2. list notable language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentation;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents
Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial time;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of Trade, Economic and Self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the Judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914; formation of political parties in Nigeria; Nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian Civil War). Concept of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigeria people; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage and development; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (the 3R's – Reconstruction, Rehabilitation and Re-orientation), Re-orientation strategies: Operation Feed the Nation (OFN), green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), mass mobilization for self-reliance, social justice and economic recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

BIO 101: General Biology I (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. explain cell structure and organizations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents

Cell structure and organization. functions of cellular organelles. characteristics and classification of living things. chromosomes, genes their relationships and importance. General reproduction. Interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism). Heredity and evolution (introduction to Darwinism and Lamarckism, Mendelian laws, explanation of key genetic terms). Elements of ecology and types of habitat.

BIO 102: General Biology II (2 Units C: LH 30)

Learning Outcomes

At the end of the lectures, students should be able to:

1. List the characteristics, methods of identification and classification of Viruses, bacteria and fungi;
2. state the unique characteristics of plant and animal kingdoms;

3. describe ecological adaptations in the plant and animal kingdoms;
4. explain nutrition, respiration, excretion and reproduction in plants and animals; and
5. describe growth and development in plants and animals.

Course Contents

Basic characteristics, identification and classification of viruses, bacteria and fungi. A generalized survey of the plant and animal kingdoms based mainly on the study of similarities and differences in the external features. Ecological adaptations. Briefs on physiology to include nutrition, respiration, circulatory systems, excretion, reproduction, growth and development.

BIO 107: General Biology Practical I (1 Unit C: PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents

Common laboratory hazards: prevention and first aid; measurements in biology. Uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy and proportion. Use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101.**

BIO 108: General Biology Practical II (1 Unit C: PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. describe the anatomy of flowering plants;
2. differentiate types of fruit and seeds;
3. state ways of handling and caring for biological wares;
4. describe the basic histology of animal tissues; and
5. identify various groups in the animal kingdom.

Course Contents

Anatomy of flowering plants, primary vegetative body: stem, leaf and root to show the mature tissues namely parenchyma, collenchyma, sclerenchyma, xylem and phloem. Types of fruits and seeds. Care and use of dissecting kits and other biological wares. Dissection and general histology of animal tissues based on vertebrate forms. Morphology and functions of epithelial, muscular, nervous and connective tissues. Examination of various groups of lower invertebrates

under microscopes, identification of various groups of organisms in Animal Kingdom. And any experiment designed to emphasize the practical aspects of topics in BIO 102.

CHM 101: General Chemistry I (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. define atom, molecules and chemical reactions;
2. discuss the Modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionization energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation – reduction equation and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridized orbitals;
7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridization and shapes of simple molecules. Valence Forces. Structure of solids. Chemical equations and stoichiometry; Chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry. Rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reactions;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of Transition metals.

Course Contents

Historical survey of the development and importance of Organic Chemistry. Fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The Chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents

Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, the students should be able to:

1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;
5. perform solubility tests on known and unknown organic compounds;
6. conduct elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents
Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

MTH 101: Elementary Mathematics I (Algebra and Trigonometry) (2 Units C: LH 30)

Learning Outcomes
At the end of this course students should be able to:
1. explain basic definition of Set, Subset, Union, Intersection, Complements and use of Venn diagrams;
2. solve quadratic equations;
3. Solve trigonometric functions;
4. identify various types of numbers; and
5. solve some problems using Binomial theorem.

Course Contents
Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers, integers, rational and irrational numbers. Mathematical induction, real sequences and series. Theory of quadratic equations. Binomial theorem. Complex numbers. Algebra of complex numbers. The Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Learning Outcomes
At the end of this course students should be able to:
1. identify the types of rules in differentiation and integration;
2. describe the meaning of Function of a real variable, graphs, limits and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents
Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of differentiation. Methods of integration, Definite integrals. Application to areas, volumes.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes
At the end of this course, the student should be able to:
1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics.
4. apply Newton's laws to describe and solve simple problems of motion.

5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects.
6. explain and apply the principles of conservation of energy, linear and angular momentum.
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Courses Contents

Space and time. Units and dimension, Vectors and Scalars. Differentiation of vectors: displacement, velocity and acceleration. Kinematics. Newton laws of motion (Inertial frames, Impulse, force and action at a distance, momentum conservation). Relative motion. Application of Newtonian mechanics. Equations of motion.Conservation principles in physics. Conservative forces. Conservation of linear momentum. Kinetic energy and work. Potential energy. System of particles. Centre of mass. Rotational motion:Torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates. Conservation of angular momentum. Circular motion. Moments of inertia. gyroscopes and precession. Gravitation: Newton's Law of Gravitation. Kepler's Laws of Planetary Motion. Gravitational Potential Energy. Escape velocity. Satellites motion and orbits.

PHY 102: General Physics II (Electricity & Magnetism) (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the student should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of ac voltages and currents in resistors, capacitors, and Inductors.

Course Contents

Forces in nature. Electrostatics; electric charge and its properties, methods of charging. Coulomb's law and superposition. electric field and potential. Gauss's law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators, current, voltage and resistance. Ohm's law and analysis of DC circuits. Magnetic fields. Lorentz force. Biot-Savart and Ampère's laws. magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances. Faraday and Lenz's laws. Step up and

step-down transformers: Maxwell's equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

PHY 107: General Practical Physics I (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

Course Contents

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

PHY 108: General Practical Physics II (1 Unit C: PH 45)

Learning Outcomes

At the end of this course, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs;
5. draw conclusions from numerical and graphical analysis of data; and
6. prepare and present practical reports.

Course Contents

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements. The treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

200 Level

GST 212: Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes
A student who has successfully gone through this course should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents
Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 211: Entrepreneurship and Innovation (2 Units; C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. Explain the concepts and theories of entrepreneurship, entrepreneurship, opportunity seeking, new value creation, and risk taking.
2. State the characteristics of an entrepreneur.
3. Analyse the importance of micro and small businesses in wealth creation, employment, and financial independence.
4. Engage in entrepreneurial thinking.
5. Identify key elements in innovation.
6. Describe stages in enterprise formation, partnership and networking including business planning.
7. Describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world.
8. State the basic principles of e-commerce.

Course Contents
Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem

solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

AGR 201: Principles of Agronomy (3 Units C: LH 45)

Learning Outcomes

Students will be equipped with:

1. basic agronomic terminologies;
2. knowledge of and basis of crop distribution across climatic regions;
3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification; and
5. knowledge of soil management needs and some conservation practices.

Course Contents

Definitions of the terms, crops and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.). Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies.

Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.

AGR 202: Introduction to Agricultural Economics, Extension and Rural Sociology (3 Units C: LH 45)

Learning Outcomes

At the end of the course students will be able to:

1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;

6. define and make valid comparison on agricultural extension methodologies world over;
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents
The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions. Cost analysis and functions. Concept of elasticities. Type of markets: perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation. International trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world. Basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology. Importance of rural communities and institutions. Social stratification. Social processes and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

AGR 203: Introduction to Forest Resources & Wildlife Management (2 Units; C: LH 15; PH 45)

Learning Outcomes
The students will be able to:
1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and
5. raise seedlings of economic tree species.

Course Contents
Renewable natural resources availability. Distribution and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification. Morphology. Taxonomy. Ecology of tropical forest trees and game reserves in Nigeria. Silviculture. Afforestation characteristics of major timbers and their uses. Forest production activities. Forest protection. Regulation of harvests for sustained yield. Importance of forestry and wildlife to the national economy. Practical approach to Apiculture. Snailery. Cane rat farming and other forest enterprises.

AGR 204: Introduction to Animal Production (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students are expected to have known the following:
1. prospects and problems of the animal industry;
2. identification/description of types of farm animals;
3. feeds and feeding management of farm animals;

4. housing and management systems of different livestock;
5. principles of animal health management;
6. animal breeding and breed improvement principles;
7. basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc).

Course Content

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production. Feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and rabbits). Introduction to game and companion animals. General principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation Anatomy and physiology of the cell. Tissues. Nervous system. Skeletal system. Muscle. Bone. Circulatory system. Reproductive. Digestive. Special senses and other systems of farm animals.

AGR 205 Introduction to Fisheries and Aquaculture (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students will be able to:

1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

Course Contents

Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological. Economic and cultural importance of fisheries park. Zoo. Sport fishing. Marine park, etc. Scope of fisheries and aquaculture.

AGR 206 Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: LH 30)

Learning Outcomes

At the end of this course students should be able to:

1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;
8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

Course Contents

Philosophy. Scope. Objectives. Historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post- harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food. Factors contributing to texture, colour, aroma, and flavour of food. Cost, traditional and ethnic influence of food preparation and consumption pattern.

AGB 201: Introduction to Business (2 Units C: LH 30)

Learning Outcomes

At the end of the course the student should be able to:

1. identify business cycle process to establish an enterprise in agribusiness;
2. identify the functions of business organisations; and
3. analyse challenges facing business enterprises.

Course Contents

Business definitions and scope. The characteristics of business: Social, legal and economic perspectives. Forms of business ownership. Management and characteristics. Functions of business organization: marketing, production, finance and accounting functions. Government and business. The social responsibilities of business. Internal problems of business enterprises in Nigeria. Business environment. Agribusiness: Definition and scope. Characteristics and classification of agribusiness. Based on output and based on stage of production. Prospects and challenges of agribusiness in developing countries.

AGB 203: Business Law I & II (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. provide legal backing to the establishment of business enterprise;
2. apply legal decision in the running of the Agribusiness enterprise;
3. familiarise with the various legal sectors and their jurisdictions.; and
4. understand the Conditions governing business transactions with individuals and corporate organisations.

Course Contents

The Nigerian legal system divisions and sources of Nigerian law common law and equity. Case law and precedent. Legislation including the nature and effects of Military Decrees, edicts and statutes. Interpretations. Customary law and Sharia law – meaning and scope. The court system: Outline of the structure and hierarchy of courts. Officers of the court. Qualifications of judges. Compositions and jurisdictions of various court summons. Outline of the nature of special tribunals. Forms of legal liability substance. Comparison and contrasts between criminal and civil ability. Defamation (i.e libel and slander). Negligent misstatements and passing off. Law of contract-nature and essential elements of a valid contract. Offer and acceptance: consideration formality, capacity, consent vitiating factors. Privity of contract, terms of contracts, discharge of contract, remedies for breach of contract, termination of contract, etc. Law of Agency-its creation and types. Rights and duties of principal and agents termination of agency. Sale of Goods-meaning and types of relevant goods. Conditions: warranties and caveat emptor doctrine, transfer of title and risks. The duties and rights of seller and buyer. Breach of the sale of goods contract and remedies. Law of Tort-Definition of Tort. Tort of Professional negligence, vicarious liability, criminal and civil liability. Hire purchase- its meaning and formation, the right and obligations of the parties. Contract of employment- the nature and formation of contracts of employment, rights and duties of employers and employees, termination and dismissal, and remedies for breach of employment contract, redundancy. Insurance contract- Its meaning, features and outline of concepts and principles; insurable interest, premium, indemnity and fixed sum insurance, subrogation and contribution. Assignment of policy, partnership;- Definitions, nature and types; general and limited partnerships; formation and articles of partnership, types, rights and duties of partners. Relationship of partners with each other and with third partners, dissolution of partnership. Banking and Negotiable instruments. The legal relationship of banker and customer and their mutual duties. The meaning and characteristics of negotiable instruments (Bill of Exchange, Cheques, promissory notes, etc.); Right and duties of the parties to a Bill of Exchange including the rights and duties of the holder in due course. Cheques and their crossing. Trust and Estate. Administration- Appointment, duties, powers, rights and accounts of trustees, executors and administrators. Bankruptcy- Issue of receiving order. Appointment duties and powers of official receiver and trustee in bankruptcy. Statement of affairs and deficiency

AGB 202: Agribusiness Communication Skill (2 Units C: LH 30)

Learning Outcomes

By the end of the course the students should be able to:

1. distinguish the various modes of communication elements;
2. appreciate theories of communication for relevant applications;

3. practice to acquire skills of verbal and nonverbal communication; and
4. effectively communicate business activities and transactions both in oral and written styles.

Course Contents
Rudiments of Communication: Communication defined. Elements of Communication, Principles of Communication: Oral, Written and Nonverbal Communication: Language defined, Non-verbal communication, Listening, Oral and written Communication; Functions and settings of Communication. Functions of Communication. Communication setting. Communication theories and Models: Linear Model. Interactional Model. Transactional Model etc. Writing and Communication Methods: Writing defined. Stages of Writing; other Aspects of the Writing process. Corporate and Public Communications. Commercial Communication Method and Letter Writing. Process of Meeting. Conferences. Seminar. Symposium and Debates: Meetings defined. Conduct. Procedures Aims and Benefits/Disadvantages of Meetings. Written Rules Affecting Meetings. Conference. Seminar. Symposium and Debates. Uses of Words. Sentences and Figurative Expressions. Words and their Meanings. Synonyms and Antonyms. Dynamism in Words and Predication. Suffixation. Sentences/Figurative Expression. Reports and Handover notes: Types of Reports, Components of Reports and Handover Notes. Organization communication: The concept of organizational communication. Factors Affecting Effectiveness of organizational Communication. Types of organizational Communication. Public Relations and marketing Communication. Common terminology in Agribusiness communication.

300 Level

GST 312 Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflicts and violence;
3. differentiate between conflict and terrorism; enumerate security and peace building strategies; and
4. describe roles of international organisations, media, and traditional institutions in peace building.

Course Contents
Concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes and rivalries. Economic inequalities, social disputes, nationalist movements and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute

resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis

ENT 312: Venture Creation (2 Units; C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises; conduct entrepreneurial marketing and e-commerce;
7. apply a wide variety of emerging technological solutions to entrepreneurship; and
8. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies).

FST 301: Food Microbiology (3 Units; C: LH 30; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. understand natural flora of importance in foods, their behaviour and uses in the food industry,

2. enumerate the food and water-borne diseases; and
3. identify the various laboratory methods of assessing microbiological status of different classes of food commodities

Course Contents
Natural flora of importance in foods, their behaviour and uses in the food industry. indicator, pathogenic and spoilage micro-organisms. microbiology of water supplies. contamination from sewage; handling; processing dust, etc. Food and water-borne diseases. food infections and toxicants. identification of food-poisoning micro-organisms. Laboratory methods of assessing microbiological status of different classes of food commodities – beverages, cereals, roots and tubers; fruits and vegetables, meat, fish and dairy products. Microbiological standards and criteria. Indices of food sanitary quality.

FST 302: Basic Food Chemistry (2 Units; C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. understand the general methods of proximate analysis of food;
2. determine important food constituents including food colours, trace elements and contaminants;
3. identify free and bound lipids; and
4. distinguish between the basic principles involved in Lane & Eynon's, Munson & Walker, and Dubois methods

Course content
Proximate analysis of food; analysis of moisture, crude fat, crude protein, crude fibre, ash and total carbohydrate. Determination of important food constituents including food colours, trace elements and contaminants. Other methods of protein determination apart from total Nitrogen by Kjedahl method. Determination of free and bound lipids. Gravimetric/Volumetry and colourimetric methods of sugar determinations; Lane & Eynon's, Munson & Walker, and Dubois methods.

FST 303: Food Process Engineering (2 Units; C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. understand the thermophysical properties of food;
2. establish the glossary of thermophysical properties of foods and methods of determinations and relevance to food processing,;
3. appraise food composition versus thermos physical properties, thermal processing;
4. understand the basic principles involved in application of fluid flow theory;
5. describe the basic fluid properties; fluid transportation system in food processing, components classification and selection criteria; pumping power requirement and classification;
6. understand the Food dehydration theory and applications; and
7. calculate the drying rate, time and equilibrium moisture content.

Course Contents
Thermophysical properties of Food: Glossary of thermophysical properties of foods and methods of determinations, Relevance to food processing, Food composition versus thermophysical properties. Thermal processing: Retort processing and controls; thermal death time equivalent; Relevance and calculation of D, Z, Q_{10} values for some thermal treatments. Application of fluid flow theory: Basic fluid properties; fluid transportation system in food processing, components classification and selection criteria; pumping power requirement and classification. Food dehydration theory and Applications: Drying theory, calculations of drying rate, time and equilibrium moisture content; dehydration equipment, classification and selection.

FST 304: Principles of Food Analysis (3 Units; C: LH 30; PH 45)

Learning outcomes
At the end of this course, students should be able to:
1. clearly understand the physical and chemical changes occurring in foods during handling;
2. describe the processing and storage and moisture in foods; ;
3. describe the pectic substances and plant hydrocolloids;
4. understand the enzyme systems important to food quality; and
5. describe the vitamins and natural pigments in food.

Course Contents
Physical and chemical changes occurring in foods during handling, processing and storage. Moisture in foods. Hydrogen bonding, free and bound moisture, lipids in foods – fats and oils, fatty acids, phospholipids and derived lipids. Chemical and physical properties of natural fats and oils. Flavour changes in fats and oils, Determination of lipids, auto oxidation of unsaturated fatty acids, pro-oxidants, and antioxidants in foods. Methods of measurement of changes in food lipids. Hydrogenation and inter-esterification of lipids. Proteins in foods. Physical and chemical properties of proteins. Nature and denatured proteins, gel formation. Pure proteins from some foods; plant proteins, animal proteins used as food such as gluten of wheat, casein of milk, whey proteins. Food carbohydrates, monosaccharides, disaccharides, oligosaccharides and polysaccharides. Pectic substances and plant hydrocolloids. Changes of carbohydrate on cooking – gelatinization retrogradation, modifications of starches and applications of modified starches. Enzyme systems important to food quality and application in the food industry. Browning reactions. Enzymes and non-enzymic browning reactions – Nature, occurrence and inhibition. Vitamins and Natural pigments in food; water soluble and fat soluble vitamins, physical and chemical properties of vitamins and their stability in foods. Food flavours and additives and their roles in foods and significance in organoleptic analysis.

FST 305: Principles of Sensory Evaluation (2 Units C: LH 30)

Learning Outcomes
At the end of this course, students should be able to:
1. understand the human senses of olfaction and gestation, taste and smell receptors, organoleptic assessment of processed foods;
2. determine accessibility, and statistical interpretation of data; and
3. carry out sensory evaluation from the perspectives of marketing; research and product development.

Course Contents
The human senses of olfaction and gestation, taste and smell receptors. mechanism of taste and smell perception. organoleptic assessment of processed foods to determine accessibility – operating conditions for sensory testing, assessment methods and scores. Statistical interpretation of data. Sensory evaluation from the perspectives of marketing; research and product development.

FST 306: Unit Operations in Food Processing (3 Units; C: LH 30; PH 45)

Learning outcomes
At the end of this course, students should be able to:
1. understand the units and dimensional analysis;
2. identify the basic principle of unit operations in food process engineering of material and energy balance; and
3. describe the various methods of separation processes and evaporation principles and types.

Course Contents
Units and Dimensional analysis. Basic principle of unit Operations in Food Process Engineering material and energy balance. Material handling and related preliminary operations such as cleaning, grading and sorting. Mechanical separation: sedimentation, centrifugation/cyclone separation, sieving and particle size analysis. Membrane separation processes – theory and applications of distillation extraction, expression, reverse osmosis. Contact equilibrium separation processes – theory and applications of absorption, extraction, crystallisation and exchange absorption. Evaporation – multiple effects, principles and types.

400 Level

FST 401: Food Quality Control and Plant Sanitation (3 Units; C: LH 30; PH 45)

Learning Outcomes
At the end of this course, students should be able to
1. understand the historical background and definitions, scope; significance, meaning of quality and quality control, be able to determine quality in relation to reliability, price, delivery, accounting, purchasing;
2. evaluate the case studies of organisation of quality control in typical food companies;
3. set up specifications for microbiology, chemical and entomological standards. statistical quality control – types of errors and decision making; control charts for variables and attributes – construction and uses; sampling plans;
4. identify the sensory quality control – assessment scores and interpretation of data;
5. understand the Codex Alimentarius legislation and codes of practice; biological and aesthetic problems of poor plant sanitation; and
6. describe the waste and effluent disposal; plant design, installation and operation for cleaning purposes; disinfection, sterilisation and detergency in processing area; cleaning by dismantling; cleaning-in-place technology, personal hygiene in the food factory.

Course Contents
Historical background and definitions; scope; significance, meaning of quality and control. Quality in relation to reliability, price, delivery, accounting, purchasing; case studies of organisation of quality control in typical food companies, setting specifications for microbiology, chemical and entomological standards. Statistical quality control – types of errors and decision making; control charts for variables and attributes – construction and uses; sampling plans. Sensory quality control – assessment scores and interpretation of data. The codex Alimentarius legislation and codes of practice. Biological and aesthetic problems of poor plant sanitation. Waste and effluent disposal; plant design, installation and operation for cleaning purposes; disinfection, sterilisation and detergency in processing area; cleaning by dismantling; cleaning-in-place technology, personal hygiene in the food factory.

FST 403: Fruits and Vegetables Technology (3 Units; C: LH 30; PH 45)

Learning Outcomes
At the end of this course, students should be able to:

1. understand the handling of fresh fruits and vegetables, chemical control of enzymic and non-enzymic changes, grading, sorting, cleaning;
2. describe peeling, sampling and size reduction;
3. categorise the raw materials for the fruits and vegetables industry – citrus, mangoes, onions, bananas, etc.;
4. distinguish between the botanical characteristics, composition, harvesting, storage and preservation;
5. study and understand the Controlled Atmosphere technology;
6. understand the theory and applications of canning of fruits and vegetables;
7. understand the codex Alimentarius legislation and codes of practice;
8. appreciate the biological and aesthetic problems of poor plant sanitation,
9. understand the various waste and effluent disposal; and
10. describe plant design, installation and various operations for cleaning purposes; disinfection, sterilisation and detergency in processing area; cleaning by dismantling; cleaning-in-place technology, personal hygiene in the food factory.

Course Contents
Handling of fresh fruits and vegetables, chemical control of enzymic and non-enzymic changes, grading, sorting, cleaning. Peeling, sampling and size reduction. Raw materials for the fruits and vegetables industry – citrus, mangoes, onions, bananas, etc; botanical characteristics, composition, harvesting, storage and preservation, controlled Atmosphere technology. Canning of fruits and vegetables – theory and applications; Dehydration processes including freeze-drying, spray-drying and sun drying; processing of fruit drinks and juices, jams and preserves, tomato paste products and pickles. Techniques of blanching, clarification, stabilization and can-sterilisation.

400 Level 2nd Semester

Industrial Attachment (24 Weeks)

Learning outcomes
Students would be attached to various standard food and beverage industries for 24 weeks under the Students' Industrial Work Experience Scheme (SIWES) and the students' work experience programme (SIWEP). Students would be expected to receive sufficient practical training in production, quality control, engineering and maintenance as well as marketing under strict industrial conditions and supervision. Students should be assessed based on seminar presentation, their reports and assessment by their supervisors.

Course Content
FST 402 Industry-based Supervisor's Assessment (SIWES) (4 Units C: PH 180)
FST 404 University-based Supervisor's Assessment (SIWES) (4 Units C: PH 180)
FST 405 Students' Reports and Practical Presentation (SIWES) (4 Units C: PH 180)

500 Level

FST 501: Cereals and Tubers Technology (3 Units; C: LH 30; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. clearly understand the various types of cereals and tubers – botanical characteristics, compositions, and properties;
2. appraise the flour-milling processes for maize, sorghum, millet, cassava, yams, cocoyams, etc.;
3. assess the chemical, physical and physiological changes in cereals and tubers during storage and handling and their methods of preservation;
4. understand the technology of composite flours and flour confectionery products (such as macaroni, spaghetti, etc).;
5. enumerate the processing technology for cereals (maize, rice, sorghum, wheat) and tubers (cassava, yams and cocoyams); and
6. formulate the cereals and tuber enrichment technologies.

Course Contents
Types of cereals and tubers – botanical characteristics, composition, and properties, flour milling from maize, sorghum, millet, cassava, yams, cocoyams, etc. Chemical, physical and physiological changes in cereals and tubers during storage and handling. Methods of preservation. Technology of composite flours and flour confectionery products (such as macaroni, spaghetti, etc). Processing technology for cereals (maize, rice, sorghum, wheat) and tubers (cassava, yams and cocoyams). Cereals and tuber enrichment technologies.

FST 502: Meat Science & Fish Science & Technology (3 Units; C: LH 30; PH 45)

Learning Outcomes
At the end of this course, students should be able to:

1. clearly understand the science and technology of converting meat-type animals to human food; anatomy, physiology and histology of domestic animals;
2. identify the slaughter and dressing of table birds;
3. understand the methods of curing, canning and drying of fresh meat and intermediate moisture meat;
4. appraise the factors affecting meat quality – physical, chemical, microbiological and management;
5. assess the traditional and scientific principles involved in the processing technology of meat products – sausages, ham, bologna, frankfurters, salting, boiling, smoking, curing, etc.;
6. study and categorise the principles, practices and equipment for fish refrigeration and freezing, drying, salting, smoking, pickling, canning and irradiation of fish protein concentrate, meal, sauces and other fish products; product quality considerations; and
7. describe egg quality, handling, freezing, pasteurization, drying, production, quality control, storage and utilisation of egg, poultry and meat products.

Course Contents

Science and technology of converting meat-type animals to human food; anatomy, physiology and histology of domestic animals. Introduction to slaughter and dressing of table birds; curing, canning and drying of fresh meat; intermediate moisture meat. Factors affecting meat quality – physical, chemical, microbiological and management. Traditional and scientific principles involved in the processing technology of meat products – sausages, ham, bologna, frankfurters, salting, boiling, smoking, curing, etc. Principles, practices and equipment for fish refrigeration and freezing, drying, salting, smoking, pickling, canning and irradiation of fish protein concentrate, meal, sauces and other fish products; product quality considerations. Egg quality, handling, freezing, pasteurisation, drying. Production, quality control, storage and utilisation of egg, poultry and meat products.

FST 503: Fats and Oils Technology (3 Units; C: LH 30; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. understand the status of the oils and fats industry in Nigeria;
2. describe the various oil seeds of Nigeria – characteristics, composition and uses;
3. enumerate the raw materials for the vegetable oil industries – palm, coconut, groundnut, soyabeans, cottonseed, sunflower seed;
4. appraise the effects of climatic conditions, harvesting and storage on quality of glycerides; and
5. describe the refining of oil and storage quality indices.

Course Contents

Status of the oils and fats industry in Nigeria; oil seeds of Nigeria – characteristics, composition and uses. Raw materials for the vegetable oil industries – palm, coconut, groundnut, soyabeans, cottonseed, sunflower seed; effect of climatic conditions, harvesting and storage on quality of glycerides. Refining of oil and storage quality indices.

FST 504: Milk and Dairy Technology (3 Units; C: LH 30; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. understand the technology of milk and milk products, (etc.) liquid milk, filled milk, ice-cream, cheese, cultured milk, butter, etc.);
2. appreciate the milk production practices including site, building and equipment selection;
3. understand the organisation and operation of the milk processing unit including milk collection, reception;
4. describe the standardization and heat-treatment of milk;
5. understand the whey as a by-product in milk processing;
6. categorise the cleaning and disinfecting operations in dairy industry; and
7. evaluate the dairy waste management and application of HACCP in dairy industry.

Course Contents

Technology of milk and milk products, (such as) liquid milk, filled milk, ice-cream, cheese, cultured milk, butter, etc.). Milk production practices including site, building and equipment selection. Organisation and operation of the milk processing unit including milk collection, reception, standardisation and heat-treatment of milk. Whey as a by-product in milk processing. Cleaning and disinfecting operations in dairy industry. Dairy waste management and application of HACCP in dairy industry

FST 505: Food Products Development (3 Units; C: LH 30; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. understand the product concept from the business perspective;
2. categorise the differentiations between product item, line and mix;
3. understand the product life cycle;
4. appreciate the basic consideration for new product development or improvement; strategies and sequence of steps in test marketing;
5. identify product failure/elimination;
6. prepare feasibility report use specific practical projects in the laboratory to obtain experience in developing information and applying it to decision making as often encountered in the food industry; and
7. apply basic knowledge of chemical, physico-chemical, engineering, sensory and management principles to the processing, preservation and storage of foods.

Course Contents

Product concept from the business perspective – differentiations between product item, line and mix, product life cycle, basic consideration for new product development or improvement; strategies and sequence of steps in test marketing; product failure/elimination; feasibility report preparations. Students would use specific practical projects in the laboratory to obtain experience in developing information and applying it to decision making as often encountered in the food industry. An integrated application of basic knowledge of chemical, physico-chemical, engineering, sensory and management principles to the processing, preservation and storage of foods will be required. A detailed report submitted at the end of the project would contribute a major part of the students' assessment in this course.

FST 598: Seminar (2 Units C: LH 30)

Learning Outcomes
At the end of this course, students should be able to:
1. present a write-up on areas of Food Science and Technology that are of interest; and
2. they are to defend and be assessed by a panel of examiners.

Course Contents
The seminar presentation(s) on special topics.

FST 599: Research Project (6 Units C: PH 270)

Learning Outcomes
At the end of this course students should be able to:
1. carry out a research investigation on any area(s) of food science and technology under the supervision of an academic staff or a supervisory panel of academic staff;
2. make an oral presentation at a seminar of the projects plan and/or a literature review on the project topic before the investigation and/or of the findings after the completion of the research; and
3. Produce a final report on the research project should be compiled, typed and bound in a format designed by the department.

Minimum Academic Standards

Equipment
Food Microbiology/Fermentation Laboratory
1. Microscopes
2. Incubators
3. Fermenters
4. Air Oven
5. Water bath
6. Refrigerator
7. Inoculating chamber
8. Incubator
9. Weighing balance
10. Autoclave
11. Anaerobic culture jar
12. Fermenter
13. Binocular Microscope
14. Monocular Microscope
15. Hand pH meter
16. Colony counter

Food Processing/Preservation Laboratory
1. Air Oven
2. Attrition Mill
3. Bread maker

4. Canning seaming machine
5. Citrus juice extractor
6. Deep fryer
7. Dicing/Slicing machine
8. Drying cabinet
9. Filter press
10. Gas cooker
11. Grain moisture Meter
12. Hammer mill
13. Home juice extractor
14. Homogenizer
15. Humidity chamber
16. Incubator
17. Juice Dispenser (double chamber)
18. Kenwood mixer
19. Smoking Kiln
20. Kitchen scale
21. Manual Corking machine
22. Microwave oven
23. Multi-fruit Juice Extractor
24. Oil expeller
25. Open top evaporator
26. Oven for bread making
27. Pilot tray dryer
28. Pin disc mill (attrition mill)
29. Plate heat exchanger
30. Refrigerator
31. Ribbon mixer
32. Sealing machine
33. Temperature Controlled bath

Biochemistry/Nutrition Laboratory

1. Temperature Hygrometer
2. Thermo Hygrometer
3. Weighing Machine (Floor type for body weight)
4. Weighing scale
5. Animal cage
6. Flame analyser
7. Kjeldhal auto analyser
8. Spectrophotometer
9. Temperature Hygrometer
10. Thermo Hygrometer
11. Stainless steel autoclave

Food Chemistry/Analytical Laboratory

1. Air oven
2. Analytical weighing balance
3. Atomic Absorption Spectrophotometer

4. Auto sampler
5. Brabender Amylograph
6. Centrifuge
7. Cold centrifuge
8. Colorimeter
9. Electric cooker
10. Flame analyzer
11. Fluorimeter
12. Freeze dryer
13. Fume chamber
14. Furnace
15. Gas Chromatography machine.
16. Genlab Drying cabinet
17. Glassware dryer
18. H.P.L.C.
19. Hand pH meter
20. Heating mantles
21. Infrared spectrophotometer
22. Kjeldahl distillation unit
23. Kjeldahl thermos digester
24. Magnetic stirrer
25. Malex blender
26. Muffle furnace
27. PH meter
28. Refractometer
29. Refrigerated Centrifuge
30. Refrigerator
31. Sieve shaker
32. Soxhlet apparatus
33. Spectrophotometer
34. Table Top pH meter
35. Vacuum Oven
36. Viscometer
37. Water bath
38. Water bath (Temp. Controlled)
39. Water Bath (with shaker)
40. Water distiller
41. Weighing balance
42. pH meter
43. Engineering Workshop for fabrication, equipment design and workshop practice
44. Lathe machine
45. Welding machine
46. Other equipment

Staffing

Academic Staff

The NUC guidelines on staff / student ratio for Food Science and Technology Discipline is 1: 15. However, there should be a minimum of six full-time equivalent of Staff in each programme.

There is need to have a reasonable number of Staff with PhD, as well as with sufficient industrial/practical experience. With a minimum credit load of 15 Units per semester and maximum of 24 credit load for students, considering a minimum of six full-time equivalent of staff in each programme. Staff should have a maximum of 15 contact hours per week for lectures, tutorials, practicals and supervision of projects.
In each programme, the academic staff number should be as per the National Universities Commission guidelines with the ration of 4: 1 to non-academic staff generally. The academic staff pyramid should be composed as follows:-

1. Professor/Reader - 20%
2. Senior Lecturer - 35%
3. Lecturer 1 and below - 45%

In employing staff, the following criteria are suggested:
The point of entry for each of the recognised academic positions should reflect appropriate academic qualifications, and experience in both teaching and professional practice. Details of the requirements for the various positions are indicated below:

Academic support personnel
Teaching Assistant / Demonstrators are recommended to assist lecturers in the conduct of tutorials, practicals and fieldwork.

Administrative support personnel
The services of the administrative support staff are indispensable to the proper administration of the departments and faculty offices. These will normally include confidential secretaries, clerical officers, typists, messengers and cleaners.

Technical support personnel
The technical support personnel shall consist of technical officers and technologists. It is important to recruit very competent senior technical staff to maintain teaching and research equipment at a ration of 5: 1 for teaching staff to technical support staff.

Library
Universities should leverage on available technology to put in place rich databases and other electronic/digital library and information resources. In addition, good stock of current hard copies of reference and other textual materials should be provided centrally at the level of the Faculty. It is expected that there should be at least 6 current books on various aspects of a programme in the Main Library of the University. A well-networked digital library should serve the entire university community. Availability of wireless facilities (such as Wi-Fi) with adequate bandwidth should enhance access to these electronic resources.

Classroom Accommodation and Teaching Support Facilities
The NUC standard space requirement of $0.65m^2$ per full-time student should be maintained for the programme. Thus, the minimum total space requirement of the Department shall be the product of its total full time equivalent student enrolment (FTE) and the minimum space requirement per full-time equivalent i.e. (FTE) $0.65m^2$.

The total space requirement shall be met by a combination of classrooms and lecture theatres of varied capacities. These should however include the following:

1. A lecture theatre, equipped with a public address system, capable of accommodating at least 250 students or at least ¼ of all FTE in the Faculty, whichever is higher;
2. At least two large classrooms, with a public address systems, capable of accommodating from 100 to 150 students;
3. One computer room capable of accommodating at least 50% of total students population at any given time as well as adequate number of internet ready personal computers, word processors; and
4. Each classroom should be furnished with comfortable chairs and desks befitting of a university. The classroom should be equipped with smart boards and multimedia facilities

Office Accommodation

Each academic staff should have an office space of at least 25 square metres taking into cognizant the status/cadre of the staff. In addition, there should be a Head of Department's office. The HOD and Professors Offices should be ensued (ie. having toilet facilities), with attached offices for their supporting staff as specified below:

Minimum Space Requirement

S/N	Space	Use	Minimum (m^2)
1.	Professors Office	Academic	25
2.	Head of Department	Administration	30
3.	Senior Lecturer	Academic	12
4.	Other ranks of academic staff	Academic	10
5.	Senior Technical Staff	Technical	12
6.	Senior Administrative Staff	Administration	12
7.	Junior Technical Staff	Technical	9
8.	Junior Administrative Staff	Administration	9
9.	Studio Space	Students	2.5
10.	Lecturer Space	Students	0.6
11.	Seminar Space	Students	0.5
12.	Laboratory Space	Students	2.5
13	Library	Students	1.5
14.	Social Space	Students	1.5
15.	Storage Space	Students	0.6

Staff-Student common room

In order to promote both social and academic interaction among staff and between staff and students, there should be a common room of about 35(m^2) at the Faculty level, equipped with a kitchenette where staff and students could interact in an informal atmosphere.

Workshop/Studio/Laboratory

Each programme should be provided with requisite laboratories, studios and workshops with relevant equipment in relation to student population and variety of activities performed in each programme. To achieve the minimum standards for the programme, there should be:

1. Well-equipped computer laboratory with adequate desk top computers for students, including relevant computer software in each degree programme;
2. High speed Internet facilities for both staff and students;
3. A PC for each academic staff in his / her office with Internet facilities;
4. Multimedia Recording Devices (at least 4);
5. A Video recorder;
6. A video player;
7. A wide screen Television;
8. Overhead power-point, multi-media facilities;
9. Vehicle for field trips; and
10. Laboratories with diverse equipment to be provided with consumables in terms of chemicals, biological or ecological materials etc. to support the prescribed practicals.

Laboratory Requirements

Laboratories / workshops required for Food Science and Technology Programme are as follows:

1. Food Microbiology / fermentation laboratory
2. Food Processing / preservation laboratory
3. Biochemistry / nutrition laboratory
4. Food Chemistry / analytical laboratory
5. Pilot Plant Hall for pilot scale equipment for dry and wet processing.
6. Engineering Workshop for fabrication, equipment design and workshop practice.

B.Sc. Forest Resources and Wildlife Management

Overview

A four-year-full-time programme of study shall be provided leading to the award of a Bachelor degree in Forest Resources and Wildlife Management to be denoted by B.Sc. Forest Resources and Wildlife Management (B.Sc. For. Res. & Wl. Mgt.) Which may be awarded with honours or a pass degree? Instructions shall be by courses and students will be required to take an approved combination of such courses as Senate, on the recommendation of the Faculty Board, may from time to time determine.

This curriculum at the different levels will prepare students of Forestry and Wildlife Management for a successful career in their chosen fields.

Comments

The curriculum of B.Sc. Forest Resources and Wildlife management is very elaborate and comprehensive and can contribute significantly to the development and/or establishment of the Faculty of renewable natural resources management in many Nigerian universities

Philosophy

The programme is designed to produce graduates that are adequately equipped to face the present challenges in forestry and wildlife. These challenges range from environmental resources conservation and management, sustained soil, forest and wildlife productivity, addressing (where applicable) the issues of desertification and deforestation to attaining ecological stability and climate change mitigation and adaptation. The programme also focuses on self-employment and enhancing benefits of forest and wildlife products in different ecological areas through scientific processing and utilization

Note that the modified philosophy addresses the renewable natural resources (Forest and Wildlife) and more current challenges especially that of environmental management.

Objectives

1. To produce graduates who are well-equipped with skills for sustainable management of renewable natural resources. The graduates should be able to establish and profitably operate their own forestry / wildlife enterprises.
2. To produce graduates who can contribute to the local and global consensual efforts towards sustainable development of renewable natural resources.
3. To produce graduates who can contribute to the transformation and diversification of the national economy.
4. To produce graduates who can contribute meaningfully to attaining ecological stability and climate change mitigation through sustainable forest and wildlife management.
5. To produce graduates with sufficient technical, productive and entrepreneurship skills in production, research and entrepreneurship in sustainable forest and wildlife management and other related disciplines
6. To produce graduates that are relevant to themselves, the industry and society and who can contribute effectively to sustainable national development goals through sustainable forest and wildlife management.

Unique features of the programme

1. The new curriculum has similar courses with renowned Universities such as The University of British Columbia and Harvard University, most especially, in Urban Forestry, Wood Products Processing, Forest Ecology and Natural Resources Conservation.
2. Ability to understand the principles of wildlife managements as they apply to consumptive enterprises and appreciate the ecological principles that lie at the foundation of conservation biology and ecotourism is similar to the curriculum of Auburn University.
3. Application of improved timber harvesting techniques is similar to that of Oregon State University.
4. The use of GIS in solving complex forestry and wildlife problems for the total well-being of man is the main thrust of several universities.
5. This curriculum is also designed to prepare graduates who can evaluate, plan, and resolve problems in an urban and traditional forest. Emphasis is placed on urban forest management and urban wildlife which is seen as the global best practice.

Employability skills

Ability to engage in:

1. genetic multiplication of seedlings through tissue culture, germplasm and other techniques.
2. domestication of some wild animals such as grasscutter for food and economic purposes.
3. management of animals in captivity.
4. engaging in small-scale forest enterprises like apiary, snailery, arts and crafts horticulture, etc.

21st Century Skills

The programme will lead to the development and acquisition of the following 21st century skills:

1. Critical thinking,
2. Creativity
3. Collaboration
4. Communication
5. Information literacy
6. Media literacy
7. Technology literacy
8. Flexibility
9. Leadership
10. Initiative
11. Productivity
12. Social skills

Admission and Graduation Requirements

Admission Requirements

UTME – Four- Year Degree Programme

In addition to acceptable passes in UTME, candidates must obtain credit passes in the Senior Secondary Certificate (SSC) in five subjects including English Language, Mathematics, Chemistry, Biology or Agricultural Science at a maximum of two sittings. Candidates must also have at least a pass in Physics.

Direct entry
Candidates must have at least 2 credit passes in Advance level in Chemistry and Biology plus 'O' level credit passes in at least 5 subjects prescribed for UTME entry mode. Holders of ND and HND in Forest Resources and Wildlife Management related field with a minimum of Lower Credit are eligible for consideration for admission into 200 levels.

Candidates that have satisfied the above minimum SSC conditions for admission to degree option in the programme and in addition have obtained the National Certificate of Education (NCE) in a field relevant to Forest Resources and Wildlife Management with a minimum of Credit Grade (60 – 69 %) from a Nigerian College of Education recognised by the University, and with relevant subject combinations from among: Agricultural Science, Biology, Botany, Zoology and Chemistry.

Duration
The minimum duration for the programmes is 4 academic sessions (4-year duration) for candidates who enter through the UTME mode. Direct Entry candidates admitted with OND/NCE/HND will spend a minimum of 3 academic sessions (3-year duration).

Graduation requirements
To be eligible for a B.Sc. Forest Resources and Wildlife Management degree, the following conditions are to be satisfied:

1. A candidate must have passed all the prescribed courses by the Department.
2. The minimum number of course units for the award of a degree shall be 120 if the entry point is 100 Level (UTME).
3. A student with National Diploma (ND) admitted through the Direct Entry must have passed at least 90 units.

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45

PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course code	Course title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	15	45
FWM 201	Introduction to Forest Extension and Economics	2	C	30	-
FWM 202	Natural Ecosystems	2	C	30	-
FWM 303	Introduction to Remote Sensing and GIS Applications	2	C	30	-
FWM 204	Introduction to Forest Resources and Wildlife Management	2	C	15	45
FWM 205	Principles of Silviculture	2	C	30	-
FWM 206	Introduction to Wildlife Ecology	2	C	30	-
	Total	16			

300 Level

Course code	Course title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
FWM 301	Forest Inventory and Mensuration	2	C	-	90
FWM 302	Tropical Silviculture and Silvicultural Techniques	2	C	15	45
FWM 303	Environmental Impact Assessment	1	C	15	45
FWM 304	Wildlife resources management	2	C	30	-
FWM 305	Forest and Wildlife Biometrics	2	C	30	-
FWM 306	Wood Formation, Anatomy & Properties	1	C	15	-
FWM 307	Wildlife Population Analysis	1	C	15	-
FWM 308	Urban Forestry Development	1	C	15	45
FWM 309	Ethno Forestry	1	C	15	45
FWM 310	Zoo & Parks Management Techniques	1	C	-	45
FWM311	Training in Firearms and Ballistics	1	C	-	45
	Total	**19**			

400 Level

Course code	Course title	Units	Status	LH	PH
FWM 401	Multiple Land Use	2	C	30	-
FWM 402	Forest Soils	2	C	15	45
FWM 403	Forest and Wildlife Policy, Law and Administration	2	C	30	-
FWM 404	Forest and Wildlife resources	3	C	15	45

	Improvement and Protection				
FWM 405	Museum and Herbarium Techniques	2	C	-	90
FWM 406	Forest Operations and Management	2	C	-	90
FWM 407	Natural & Man-made Forest Plantation Techniques	2	C	-	90
FWM 408	Harvesting, Processing & Wood Utilization	2	C	-	90
FWM 409	Game Ranching and Domestication	2	C	15	45
FWM 410	Report Writing	1	C	-	45
FWM 498	Seminar	1	C	-	45
FWM 499	Project	4	C	-	180
	Total	**25**			

NOTE: The practical component of each course should be taken seriously, for instance a 2 unit course has 3 hours of practical per week. If this is not enough each of the 300 and 400 level semesters can be slashed by 3 weeks to create room for SIWES/attachment

Course Contents and Learning outcomes

100 Level

GST 111 Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents
Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for

effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112 Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people,; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition,; citizenship and civic responsibilities; indigenous languages, usage, and development,; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation.; Re-orientation Strategies: Operation Feed the Nation (OFN), Green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

BIO 101: General Biology I (2 Units C: LH 30)

Learning outcomes

At the end of lectures, students should be able to:

1. explain cell structure and organisations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents
Cell structure and organization, functions of cellular organelles, characteristics and classification of living things, chromosomes, genes and their relationships and importance, general reproduction, interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism); heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms), elements of ecology and types of habitats.

BIO 107: General Biology Practical I (1 Unit C: PH 45)

Learning Outcomes
At the end of the lectures, students should be able to:
1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents
Common laboratory hazards: prevention and first aid; measurements in biology; uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy, and proportion; use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101.**

BIO 108: General Biology Practical II (1 Unit C: PH 45)

Learning Outcomes
At the end of the lectures, students should be able to:
1. describe the anatomy of flowering plants;
2. differentiate types of fruit and seeds;
3. state ways of handling and caring for biological wares;
4. describe the basic histology of animal tissues; and
5. identify various groups in the animal kingdom.

Course Contents
Anatomy of flowering plants, primary vegetative body: stem, leaf, and root to show the mature tissues namely parenchyma, collenchyma, sclerenchyma, xylem, and phloem. Types of fruits and seeds. Care and use of dissecting kits and other biological wares. Dissection and general histology of animal tissues based on vertebrate forms. Morphology and functions of epithelial, muscular, nervous, and connective tissues. Examination of various groups of lower invertebrates under microscopes, identification of various groups of organisms in animal kingdom, and any experiment designed to emphasise the practical aspects of topics in BIO 102.

CHM 101: General Chemistry I (2 Units C: LH 30)

Learning Outcomes

After studying all materials and resources presented in the course, the student will be able to:

1. define atom, molecules, and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionisation energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation–reduction equations and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridised orbitals;
7. identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure, and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy;
   and
10. determine rates of reactions and their dependence on concentration, time, and temperature.

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence, forces, structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reactions, equilibrium, and thermodynamics. Acids, bases, and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II (1 Unit C: LH 30)

Learning Outcomes

At the end of this course, students will be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of transition metals.

Course Contents

Historical survey of the development and importance of organic chemistry; Fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, nanochemistry. Electronic theory in

organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanisms and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, students will be able to:
1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. tell the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course content
Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, students will be able to:
1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;
5. execute solubility tests on known and unknown organic compounds;
6. execute elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents
Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

MTH 101: Elementary Mathematics I (2 Units C: LH 30)
(Algebra and Trigonometry)

Learning Outcomes
At the end of the course students will be able to:

1. understand basic definition of set, subset, union, intersection, complements and use of venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. understand various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents

Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition, and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (1 Unit C: LH 30)

Learning Outcomes

At the end of the course students should be able to:

1. understand types of rules in differentiation and integration;
2. understand the meaning of function of a real variable, graphs, limits, and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents

Function of a real variable, graphs, limits, and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; integration as an inverse of differentiation. Methods of integration, definite integrals. Application to areas and volumes.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes

On completion, the student will be able to:

1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems based on the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents

Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton laws of motion (inertial frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of

particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes, and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits.

PHY 102: General Physics II (Electricity & Magnetism) (1 Unit C: LH 30)

Learning Outcomes

On completion, the student should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters;
   and
8. determine the characteristics of AC voltages and currents in resistors, capacitors, and inductors.

Course Contents

Forces in nature; electrostatics, electric charge and its properties, methods of charging, Coulomb's law and superposition, electric field and potential, Gauss's law, capacitance, electric dipoles, energy in electric fields, conductors and insulators, current, voltage and resistance, Ohm's law and analysis of DC circuits. Magnetic fields; Lorentz force, Biot-Savart and Ampère's laws, magnetic dipoles, dielectrics, energy in magnetic fields, electromotive force, electromagnetic induction, self and mutual inductances, Faraday and Lenz's laws. Step up and step down transformers: Maxwell's equations, electromagnetic oscillations and waves, AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

PHY 107/108: General Physics Practical I & II (2 Units C: PH 90)

Learning Outcomes

On completion, the student will be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors; and
4. plot and analyse graphs, draw conclusions from numerical and graphical analysis of data.
5.

Course Contents

This introductory course emphasises quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems,

electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

FWM 101: Tree Anatomy and Physiology (1 Unit C: PH 45)

Learning Outcomes
On completion, the student will be able to:
1. identify the morphology and anatomy of some important tropical trees;
2. understand the concept of tree growth; and,
3. identify the physiological processes in trees.

Course Contents
Comparative morphology and anatomy of some important tropical indigenous trees and their organs; tree cell and its functions; concept of growth, growth analysis and factors affecting growth, tree growth regulators and their uses; photosynthesis photorespiration and translocation; concept of tree nutrition, uptake of nutrients; nutrients metabolism and fixation.

FWM 102: Taxonomy and Autecology of Tropical Trees (1 Unit C: PH 45)

Learning Outcomes
On completion, the student will be able to:
1. identify the natural ecosystems;
2. understand the ecology of some selected tree species;
3. understand the system of tree identification and description; and,
4. identify the silvicultural characteristics of savanna tree species.

Course Contents
Introductory ecology and natural ecosystems; Basic principles of tree identification and description; Physiology of some important tropical trees; Ecology and silvicultural characteristics of savanna tree species

200 Level

GST 212. Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes
A student who has successfully gone through this course should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and

8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents
Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world; and
8. state the basic principles of e-commerce.

Course Content
Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

FWM 201: Introduction to Forest Extension and Economics (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. identify forest goods and services in the various vegetation zones;
2. identify goods and services from other regions of the world;
3. make the right decision in business establishment and make profit in any enterprises they embark upon; and
4. identify the techniques of communication and learning process in extension

Course Contents
Methods and techniques for communicating values of forestry, parks, game reserves and other wild lands.The role of the extension agent in providing organizational and administrative support in Forestry. Training programmes for extension workers in forestry and wildlife. Definition of forest goods and services. Application of economic principles to forest resources. Decision making in single and multiple resource use. Cost-benefit analysis. Importance of forests and forest products to national development.

FWM 202: Natural Ecosystems and Environmental Conservation (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. identify trees within the locality;
2. enumerate the importance of the trees so identified;
3. identify the structure and dynamics of land and fresh water eco-systems; and,
4. carry out biodiversity assessment in natural eco-systems.

Course Contents
Distribution, structure and dynamics of land and fresh water eco-systems. The flow of energy and materials through natural eco-systems. The importance of conservation of natural eco-systems. Tree identification and its importance. Biodiversity assessment in natural eco-systems. Climate change impact on natural eco-systems

FWM 203: Introduction to Remote Sensing and GIS Applications (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. apply remote sensing in forestry and wildlife management;
2. itemise the characteristics of Remote Sensing sensors and satellites;
3. analyse Remote Sensing data; and
4. integrate remote sensing with GPS and GIS.

Course Contents
Remote sensing Applications in forestry resources and wildlife management. Characteristics of Remote Sensing sensors and satellites. Reflectance properties of earth surface and atmospheric features (energy interactions, spectral reflectance curve and spectral reflectance of soil, water and vegetation). Remote sensing data analysis (visual image interpretation, digital image

processing). Integration of remote sensing with GPS and GIS. Application of Geographic Information System (GIS) in forestry projects. Application of drones in forestry and wildlife management.

FWM 204: Introduction to Forest Resources & Wildlife Management (2 Units C: LH 15; PH 45)

Learning Outcomes
The students will be able to:
6. enumerate the potentials of renewable natural resources;
7. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
8. establish small scale bee farm, snail farm, cane rat farm;
9. elucidate the importance of forestry and wildlife to the national economy; and
10. raise seedlings of economic tree species.

Course Contents
Renewable natural resources availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria. Silviculture, afforestation characteristics of major timbers and their uses. Forest production activities. Forest protection. Regulation of harvests for sustained yield. Importance of forestry and wildlife to the national economy. Practical approach to apiculture, snailery, cane rat farming and other forest enterprises.

FWM 205: Principles of Silviculture (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. propagate seeds of both indigenous and exotic species;
2. raise seedlings in the nursery using both the natural and artificial regeneration nursery techniques; and
3. establish plantation with seedlings raised from the nursery.

Course Contents
Major forest types of the tropics and silvicultural systems employed in their management. Plantation and nursery practices. Seed technology with special reference to trees. Analysis and study of problems of raising tree crops. Natural and artificial regeneration nursery techniques. Application of principles for establishment and maintenance of forest for various purposes. Taungya and other silvicultural practices. Major forest types of the tropics and silvicultural systems employed in their management. Plantation and nursery practices, seed technology with special reference to trees.

FWM 206: introduction to Wildlife Ecology (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:

1. demobilise wild animals;
2. manage wild animals in captivity;
   and
3. handle, care and feed captured animals

Course Contents
Organisation of wildlife resources. Wildlife in relation to their environment. Factors affecting the distribution and abundance of wildlife. Interrelationship between climate, soil, vegetation, geologic history and wildlife population characteristics as related to reproduction and mortality factors. Wildlife population characteristics of mortality, movement, behaviours, life-cycles, reproduction, food and food habits. Nature and efficient usage of rangeland in West Africa. Wildlife capture techniques, objective, traps and consideration for design. Immobilisation by drugs. Methods of range assessment and management. Handling, care and feeding of captured animals. Field exercises of different capture methods.

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflicts and violence;
3. differentiate between conflict and terrorism; enumerate security and peace building strategies; and
4. describe roles of international organisations, media, and traditional institutions in peace building.

Course Contents
Concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes and rivalries. Economic inequalities, social disputes, nationalist movements and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis

ENT 312: Venture Creation (2 Unit C: LH 15; PH 30)

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises; conduct entrepreneurial marketing and e-commerce;
7. apply a wide variety of emerging technological solutions to entrepreneurship; and
8. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies).

FWM 301: Forest Inventory & Mensuration (2 Units C: PH 90)

Learning Outcomes

At the end of the course, the students should be able to:

1. apply basic biometric techniques to problems in forest resources management;
2. prepare management plans for forest estates;
3. measure various parameters using modern equipment;
4. take inventory of forest resources for proper management of forest estates;
5. construct management tables;
6. and
7. apply sampling and enumeration techniques in measurement and enumeration of timber in logs and forest stands.

Course Contents
Application of basic biometric techniques to problems in forest resource management. Distributions, sampling and tests of hypothesis. Working plans as management tools. Components of working plans. Survey techniques in relation to forestry problems. Processing of resource inventory and mensuration data for management purposes. Forest mensuration - meaning and aims. Measurement and instruments for measuring diameter and height, tree taper and form. Inventory instruments and their use. Stand measurement. Forest resources inventory measurement. Advanced sampling method in inventory. Volume estimation and volume table construction. Growth increment determination. Construction of management tables. Forest resources sampling and enumeration techniques – including timber and wildlife. Measurement and estimation of timber in logs and forest stands. Inventory and biodiversity assessment for carbon sequestration.

FWM 302: Tropical Silviculture and Silvicultural Techniques (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. propagate seeds of both indigenous and exotic species and raise such successfully in the nursery;
2. establish plantation with seedlings raised from the nursery; and
3. employ silvicultural techniques to nurture the plantation to desire rotation based on the objectives of management.

Course Contents
Major forest types of the tropics and silvicultural systems employed in their management, plantation and nursery practices, procedure for introducing exotic species. Seed and Forest nursery technology. Plantation establishment and maintenance, thinning and pruning operations, rotation regeneration and protection.

FWM 303: Environmental Impact Assessment (1 Unit C: LH 15)

Learning outcomes
At the end of the course, the students should be able to:
1. conduct environmental impact assessment; and
2. ascertain the suitability or otherwise of citing any establishment or project in a particular place.

Course Contents
Definition of environmental impact assessment. Classification environmental impact assessment. Elements of environmental impact assessment. Basic guidelines in environmental impact assessment.

FWM 304: Wildlife Resources Management (2 Units C: LH 30; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:

1. identify some birds of economics importance;
2. identify techniques of coping with birds' menace;
3. detect age and sex of birds using moulting strategy.
4. manage wild animals in the wild;
5. maintain equilibrium of wild animals in the wild;
6. monitor the dynamics of wildlife population in the park;
7. stabilise population equilibrium within and among animals in the wild.
8. identify wildlife in their locality with their feeding pattern;
9. formulate animal feed; and
10. adequately feed the wild animals under captivity.

Course Contents

Classification, structure, ecology, evolution and economic importance of birds and avifauna of Africa; distribution and identification of game birds; management techniques. Avian survey and Monitoring, Migration, Ageing and sexing birds using moulting strategy, and Avitourism. Observations and records, capturing and marking wild animals, necropsy in birds and mammals, physiological indices of reproduction, sex, and age structure, estimating population, habitat study, improvement and evaluation, elementary wildlife telemetry, human factors in wildlife management. Principles of nutrition of wildlife; Nutrient composition of wildlife foods; nutrient requirements of wildlife for various physiological processes; feed formulation, ration preparation and general methods of feeding wildlife species. The role of nutrition in the survival and population dynamics of wildlife in their natural habitats. Diets and feeding programmes for selected wildlife species (*Artiodctyla, insectivora, Lafamorphis, Elephantidae, Arothropods*).

FWM 305: Forest and Wildlife Biometrics (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students should be able to:

1. apply basic biometric techniques to problems in forest resource management;
2. analyse data using various tools for expected outcome;
3. design and analyse experiments on tree crops and wildlife; and
4. apply programming such C++,C#, R- language, R Markdown, VBA, python and data science applications in Forestry, dl data Mgt tools.

Course Contents

Application of basic biometric techniques to problems in forest resource management, Distribution, sampling and tests of hypotheses. Practical concepts in the design and analysis of experiments on tree crops and wildlife. Survey techniques as they relate to forest resources and wildlife problems. Processing of resource inventory and mensuration data for management purposes. Application of multivariate analysis to forest resources and wildlife. Basic techniques in survey sampling and design. Application of programming such as C++,C#, R- language, R Markdown, VBA, python and data science applications in Forest resources and wildlife. dl data Mgt tools.

FWM 306: Wood Formation, Anatomy & Properties (1 Unit C: LH 15)

Learning Outcomes
At the end of the course, the students should be able to:
1. manage forest plantations for the production of clean bole timbers without strain knots and abnormal wood characteristics;
2. determine physical properties of wood;
3. determine chemical properties of wood; and
4. identify the characteristics that determine the various uses of wood.

Course Contents
Growth and development of trees. Timber identification. Anatomical structure of wood species. Chemo-anatomy. Factors affecting wood formation. Development and control of abnormal wood properties. Gross and microscopic structure of wood and its chemical composition. Wood formation, structures and properties. Anatomical characteristics/features of wood formation for identification. Physical and chemical properties of wood.

FWM 307: Wildlife Population Analysis (1 Unit C: LH 15)

Learning outcomes
At the end of the course, the students should be able to:
1. monitor the dynamics of wildlife population in the park with a view to stabilizing the equilibrium;
2. use capture-recapture techniques, tagging and marking;
3. determine age, sex, life table, population growth pattern; and
4. practically evaluate the wildlife resources of selected protected areas.

Course Contents
Methods of studying animal numbers and distribution. Objectives of Population assessment. Implications of population dynamics to wildlife management. Methods of studying wildlife abundance, diversity index, morphometrics and distribution. Attributes of population dynamics such as growth, mortality and density (relative and absolute). Ground and aerial censuring methods in wildlife stock assessment. Capture-recapture techniques, tagging and marking. Population structure. Reproduction and survival rate. Age and sex determination. Life tables and year class determination. Length and weight studies and their interrelationships. Survivorship curve and population growth pattern. Ethology, ecology and population structure, Hardy-Weinberg Theorem. Population regulation. Practical evaluation of wildlife resources of selected projects areas.

FWM 308: Urban Forestry Development (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. identify suitable urban tree species;
2. locate suitable sites for urban planting in any locality;
3. carry out landscaping; and
4. establish lawns.

Course Contents
Definition, scope and importance of urban forestry. Distribution and ownership of urban forests. Structure, conditions and management of urban forests. Site selection for urban planting. Tree care and maintenance in the urban environment. Definition and importance of landscaping. Ornamental plant propagation for urban planting. Landscaping and design for urban planting. Lawn establishment and management.

FWM 309: Ethno-Forestry (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. identify plants that are of ethnoforestry importance in their locality;
2. establish a garden for some of the species especially the endangered ones;
3. diagnose of diseases/ailments;
4. formulate herbal remedies with adequate standardisation; and
5. acquire skills in forest bathing.

Course content
Concept of ethno forestry. Sources and identification of ethno forestry materials. Ecological distribution and conservation of medicinal plants. Common Nigerian medicinal plants. Local diagnosis of diseases / ailments. Cultivation and commercialisation of medicinal plants. Techniques and methods of harvesting phytomedicinal materials. Techniques and methods of processing phytomedicinal plants. Prescription of Phytomedicines. Marketing and utilisation of selected ethnoforestry materials. Concept of Forest Bathing.

Course Contents
Land survey. Forest survey and wildlife population survey. Aerial photogrammetry and photo interpretation. Remote sensing techniques application to forestry and wildlife. Biometrics. Field studies of plants, animals, soil and water. Types of selected terrestrial and aquatic project areas. Evaluation of man's impact on terrestrial and aquatic ecosystems.

FWM 310: Zoo & Parks Management Techniques (1 Unit C: PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. design zoological gardens;
2. demobilise wild animals; and
3. administer first aids to ailing wild animals.

Course Contents
Basic objectives of zoo and park planning. Design of zoo and parks facilities. Capture and transportation of wildlife animals. Animal health. Handling and care of wild animals in captivity. Amusement zoo sanitation and the control of zoo visitors.

FWM 311: Training in Firearms & Ballistics (1 Unit C: PH 345)

Learning Outcomes
At the end of the course, the students should be able to:
1. handle fire arms;

2. maintain firearms; and
3. operate dart gun to demobilize wild animals.

Course Contents
Study of firearms. Types and specification of firearms and ammunitions. Maintenance of firearms. Types of shooting ranges. Animal hunting methods. Aspect of hunting sociology (hunting / land-owner relationship).

400 Level

FWM 401: Multiple Land Use (2 Units C: LH 30)

Learning Outcomes
At the end of the course, the students should be able to:
1. design an integrated farming system;
2. operate an integrated farming system; and
3. allocate land to competing demands.

Course Contents
Nigeria's land resources. Human attitudes and conflicts. Strategies for resolution of conflicts. Integrated use of land for forestry, wildlife, fisheries and agricultural purposes. Formulation of management policies for land areas. Decision making in the allocation of land for forestry, wildlife and agriculture. Legislation relating to land and environmental planning.

FWM 402: Forest Soils (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. understand soil dynamics;
2. identify soil physics, chemistry and microbiology
3. understand forest nursery soil management;
4. identify method of soil improvement

Course Contents
Understanding of soil dynamics and influence upon forest composition; slander generation, tree vigour and tree growth rate; forest soil physics, chemistry and microbiology, soil moisture movement; forest nursery soil management; forest soil fertility determination, maintenance and improvement with special reference to tropical conditions.

FWM 403: Forest and Wildlife Policy, Law and Administration (2 Units C: LH 30)

Learning outcomes
At the end of the course, the students should be able to:
1. identify the laws establishing and guiding the operations of forest estates;
2. itemise the inter-sectoral policy conflicts;
3. enumerate the procedures in constituting forest reserves in Nigeria;
4. itemise the intra-sectoral policy conflicts;
5. manage the intra-sectoral policy conflicts; and

6. draw the administrative structure or organogram of a typical forestry / wildlife department.
7. itemise the laws establishing and guiding the operations of wildlife parks and game reserves;
8. itemise the intersectoral policy conflicts;
9. manage the intersectoral policy conflicts;
10. itemise the intrasectoral policy conflicts;
11. manage the intrasectoral policy conflicts;
12. manage human-wildlife conflicts; and
13. draw administrative structure or organogram is expected.

Course Contents

Forest related natural resource polices. Planning effective use of forest resources. Policy Makers. Policy framework for forestry development. Policy processes. Intersectoral Policy Analysis. Legal framework for forestry development. Legal instruments. Constitution of forest reserves. Offences, Penalties and legal proceedings. General prohibitions and exemptions. Structure of forest administration. Problems of conserving forest and endangered species. Nigerian Laws in natural resources management. Inter-relationship of forestry departments. Administration and forest conservation for economic and recreational uses. Problems of forest conservation in Nigeria. The Organisation of Forestry Services. Wildlife and related natural resource polices; planning effective use of wildlife resources; structure of wildlife administration; wildlife conservation for economic and recreational uses, problems of wildlife conservation in Nigeria. Nigerian Law in natural resources management interrelationship of wildlife department.

FWM 404: Forest and Wildlife Resources Improvement and Protection (3 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. multiply seeds and seedlings of both indigenous and exotic species using germplasm;
2. carry out tissue culture and other modern methods; and
3. establish and manage seed orchards.
4. protect the forest estates against insects infestation;
5. prevent diseases infections;
6. prevent forest fire, drought and flooding; and
7. control pests and diseases in forest estates.
8. define law of inheritance;
9. carry out artificial insemination for rodents, game birds, snail and other animals in captivity; and
10. engage in animal cross breeding.
11. protect animals against insects infestation;
12. prevent diseases infections; and
13. prevent park fire, drought and flooding.

Course Contents

Inventory, selection and conservation of basic genetic material for mass production of improved strains for Silviculture. Theory, practice, methods of consequences of breeding tree crops; principles underlying choice of species; quantitative genetics in forest tree improvement.

Mutation. Isolation mechanism in forest breeding and genetics. Population genetics. Topophysics. Selective breeding. Economics of tree breeding; tree breeding programmes; principles, establishment and management of seed orchards. In-situ and ex-situ conservation. Scope, importance, taxonomy and biology of major pests and diseases of forest trees. Principles underlying disease and pest control; biological, Chemical, genetic and environmental control; fire use and control; protection against encroachment; diseases and illegal felling. Forest entomology - leaf eaters, sap feeders. Wood and cambial borers, root feeders. Population dynamics and forest insects, forest pathology - nature of diseases organisms, nematodes, viruses, fungi, damping off, leaf sports, rots, malformation, blight, mildews, rusts, smuts, the parasites in relation to the host plant. Factors affecting infection. Fungal pathogens of importance in forestry such as *Armllaria mellea* (a major destructive plant fungi). *Polyporus hispidus* (heart-rot fungus). Control measures. Nematology- plant parasitic nematode, symptoms of nematode infection. Virology - symptoms and control. Virus disease identification. Fire protection and control.Basic concepts of genetics. Law of inheritance. Natural and induced breeding. Artificial insemination techniques for rodents, game birds, snail, antelope and other animals in captivity. Wildlife improvement through crossbreeding. Practical experiences in artificial insemination and induced breeding. The major pests and diseases of wildlife. Taxonomy and biology of major pests and diseases of wildlife. Epidemiology of parasite population. Principles of diseases and pests control method of wildlife. International restrictions binding transportation of wildlife across country boundary.

FWM 405: Museum and Herbarium Techniques (2 Units C: PH 90)

Learning outcomes
At the end of the course, the students should be able to:
1. identify plants with the aid of flora keys;
2. collect and process flora and fauna; and
3. preserve flora and fauna species.

Course Contents
Botanical rambling for plants identification. Use of flora keys in plant identification. Collection and processing of plants for herbarium. Animal preservation techniques. Types of museums.

FWM 406: Forest Operations and Management (2 Units C: PH 90)

Learning Outcomes
At the end of the course, the students should be able to:
1. design forest roads, culverts, bridges and buildings;
2. construct truck roads and culverts and bridges when necessary;
3. use chain saw in logging operations;
4. design and prepare forest management plans based on specific management objectives; and
5. differentiate between management plan and work plan.

Course contents
Theory of road construction, drainage and maintenance. Logging and transportation. Bridge and dam construction. Planning, analysis and supervision of operations. Forest roads. Terms used in road construction. Forest bridges and culverts - bridge project operations and machines. Forest

building structures - building and construction, maintenance and protection of these structures. Design, construction, drainage and maintenance of forest roads, bridges, dams and buildings. Preparation of work plans to achieve specific management objectives. Identification of work plan components. Differences between management plan and work plan.

FWM 407: Natural & Man-made Forest Plantation Techniques (2 Units C PH 90)

Learning Outcomes
At the end of the course, the students should be able to:
1. propagate seeds of both indigenous and exotic species;
2. raise such successfully in the nursery; and
3. establish plantation with seedlings raised from the nursery.

Course Contents
Natural and man-made forest plantation techniques. Silvicultural techniques for some indigenous and exotic tree species. Tree breeding. Arboretum. Nursery techniques. Plantation establishment. Shelterbelt and agro-forestry practices. Lost crops and medicinal plants identification and establishment.

FWM 408: Forest Products Harvesting, Processing and Utilization (2 Units C: PH 90)

Learning Outcomes
At the end of the course, the students should be able to:
1. carry out harvesting of forest products without the antecedent wastage associated with it;
2. maintain safety precautions in harvesting of forest products; and
3. employ modernised methods of processing with a lot of value addition.
4. employ modernised methods of processing and preservation of non-wood forest products;
5. ensure value additions to processed non wood forest products;
6. practice sericulture, apiculture and heliculture; and
7. engage in forestry related handicrafts.

Course Contents
Timber harvesting and merchandising. Safety and precautions in timber harvesting. Sustainable Harvesting. Felling and logging techniques. Wood conversion and processing. Wood seasoning and preservation. Machining, gluing, preservation and finishing of wood products. Charcoal production. Chemical and mechanical processing of pulp and paper. Processing and utilisation of forest products. Non-timber forest products' harvesting and processing (seeds, fruits, foliage, barks, fuel wood, ferns and lianas). Non-wood forest products used in fisheries as fish poison, for production of fishing nets and lines, etc.; Sericulture: production of silk from silkworms fed with forest tree leaves, plant dyes, gum-arabic, cane for furniture, rubber, chemicals etc.; Other non-wood forest products used in homes and cottage industries.

FWM 409: Game Ranching & Domestication (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. manage the animals under captivity;

2. domesticate wild animals;
3. design cages for various types of animals; and
4. keep the animals under captivity from escaping.

Course Contents
Need for animal domestication; History of ranching and domestication; types of levels of domestication. Basis for selection of species; experimental approach to ranching and domestication; Planning and design of cages for various game species. Growth behavior and reproduction of game species. Food preference, Health care and game husbandry techniques.

FWL 410: Report Writing (1 Unit C: PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. put together a good report of the practical activities they carried out.

Course Content
Each student is expected to write the report of activities carried out during the practical year.

FWM 498: Seminar (1 Unit C: PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. Search for literature on topical issues and synthesis it into a seminar paper; and
2. present seminars with the aid of power point.

Course Contents
Each student will be required to give a seminar in the final year and participate in all Departmental seminars. Typed and bound copies of seminar to be submitted for grading to the Department.

FWM 499: Project (4 Units C: PH 180)

Learning Outcomes
1. Students are expected to: execute research projects of their choice and present such to the department.

Course Contents
Each student is required to choose and execute a special project under a supervisor. Duration of the project is a minimum of two semesters. Typed and bound project reports to be submitted at the end of project.

Minimum Academic Standards

Laboratory and Equipment Requirements for Forest Resources and Wildlife and Wildlife Management Programme

Teaching, laboratory, and field equipment are required in adequate numbers for proper training of students. Teaching practical in the absence of well-equipped laboratories will evidently reduce the quality of the graduates. Relevant teaching/laboratory equipment include overhead projectors, projection screens and other audio-visual aids, weighing balances, pH meters, microscopes, incubators, refrigerators, deep freezers, ovens, autoclaves, water bath and moisture meters.

Basic farm equipment should include tractors and accessories such as trailers. Sprayers, processing equipment and some irrigation facilities for dry season activities. We should go beyond rain-fed forestry.

Forest Resources Management

1. Aerial Photo Interpretation/GIS Laboratory
2. Herbarium
3. Wood Workshop
4. Secateurs
5. Radial Line Plotters
6. Laser based equipment such as:

1. Laser ACE hypsometer (dbh, height and volume estimation)
2. Criterion Laser (diameter at any point)
3. Laser Gator Eye Caliper (diameter at any point)
4. Haglof clinometer (height and distance)
5. Other Haglof laser equipment for range, distance and height
7. Haga Altimeters (where No. 7 is not available)
8. Spiegel Relascopes (where No. 7 is not available)
9. Girth/Diameter Tapes
10. Ranging Poles
11. Camping Beds
12. Tents
13. Camping Tables & Chairs
14. Mechanical Wood Processing Machines
15. Compasses

Wildlife Management

1. Grass-cutter colony: 5 males and 15 females
2. Snailery
3. Field glasses (binoculars)
4. Dart guns
5. Fire arms
6. Traps of different types & sizes Cages
7. Taxidermy laboratory
8. Museum

Other Equipment

Vehicles

At least one 4-wheel drive pick-up van and one pay loader tricycle.

Workshop

Workshop for training students in machine and the maintenance of farm equipment parts must be provided preferably on the University's teaching/research farm based on the user space areas of about $15m^2$/student to accommodate machinery, equipment, and students.

Standard for Library

The Department should have a library with relevant collections in Forest Resources and Wildlife Management in addition to collections from related disciplines.

The NUC recommends the following physical space requirements:

		m^2
Professor's Office	-	18.50
Head of Department's Office	-	18.50
Tutorial Teaching Staff's Office	-	13.50
Other Teaching Staff Space	-	7.00
Technical Staff Space	-	7.00
Secretarial Space	-	7.00
Academic Staff Research Laboratory	-	16.50
Seminar Space/per student	-	1.85
Laboratory Space	-	7.50

B.Sc. Horticulture and Landscape Management

Overview

Horticulture is the branch of agriculture concerned with intensively cultivated plants directly used by man for food, medicinal purposes or for aesthetic gratification (Landscape management). Horticulture now ranks as one of the fastest growing sectors of the agricultural industry in the production of fruits, vegetables and ornamental crops, but which had before now received little attention compared to the traditional training in other agricultural sectors.

The degree programme in horticulture and landscape management has as its rationale to produce highly qualified personnel, who will be competent enough to promote horticulture in vegetable production, fruit production, ornamental and landscape beautification, and management for environmental sustainability in Nigeria. This curriculum offers the minimum that is required to give effective training in the field. Some of the physical facilities needed for the training of students to the degree level are also provided.

Philosophy

The principal focus of the National Agriculture Policy is to strengthen the component parts of the agricultural sector, and the horticulture and landscape management component to meet the demand for food and environmental sustainability. The philosophy of horticulture and landscape management programme of agriculture is aimed at achieving the goals and making substantial contribution to the nation's Gross Domestic Product (GDP) and in furtherance of Nigeria's renewed commitment for food sufficiency and general self-reliance through the training of graduates that are adequately equipped with the comprehensive theoretical knowledge and practical skills required for meaningful engagement in the horticultural industry.

Objectives

The objectives of the programmes in agriculture discipline are in tandem with the national needs and priorities in the sector. Therefore, graduates of the discipline are expected to be resourceful, creative, and knowledgeable, towards solving relevant societal problems

The specific objectives of the horticulture and landscape management programme are:

1. production of highly skilled manpower in horticulture (i.e., fruits - pomology, vegetables - olericulture & landscape/ ornamental);
2. to train graduates who will be skilled in bringing innovations into horticulture through research;
3. to train graduates in the awareness of the need to ameliorate the impact of resource exploration on the environment;
4. promotion and improvement of the local technology in entrepreneurial knowledge in horticulture and resuscitation of lost indigenous horticultural crops; and,
5. generation of relevant technologies in horticulture for agro-industries and the society.

Employability skills

1. Production enterprise in horticultural crop farming
2. Production enterprise in vegetable crops farming
3. Production enterprise in orchard establishment and management
4. Seed production, processing, and packaging
5. Experts in landscape design and management
6. Research in areas of indigenous vegetables and ornamental plants

21st Century skills

1. Critical thinking,
2. Creativity
3. Collaboration
4. Communication
5. Information literacy
6. Media literacy
7. Technology literacy
8. Flexibility
9. Leadership
10. Initiative
11. Productivity
12. Social skills

Unique features of the programme

1. of the National Policy on Agriculture, making trainees more relevant to national and global agricultural sector development.
2. The programme involves a broad training at the lower levels of study such that the graduate has basic knowledge of the overall horticultural discipline and agriculture in general.
3. The practical focus is enterprise based for an adequately equipped and skilled graduate of horticultural science for relevance in the emerging challenges of food, industrial crop production, and environmental sustainability through landscaping.

Admission and Graduation Requirements

Admission requirements

Candidates are admitted into the degree programmes in any of the following three ways:

1. The Unified Tertiary Matriculation Examination (UTME)
2. Direct Entry

UTME- Four Year Degree Programme

In addition to acceptable passes in UTME, candidates must obtain credit level passes in the Senior Secondary Certificate examination (SSC) in five subjects including English Language, Mathematics, Chemistry, Biology or Agricultural Science at a maximum of two sittings. Candidates must also have at least a pass in Physics.

Direct entry mode

Candidates must have at least credit passes in Advance level in Chemistry and Biology plus 5 SSC-credit passes prescribed for UTME entry mode. Holders of ND and HND in Horticulture and

Landscape Management and related field with a minimum of Lower Credit are eligible for consideration for admission into 200-level.

Duration
The minimum duration for BSc. Horticulture and Landscape Management programme is four academic sessions (4-year duration) for candidates who enter through the UTME Mode.
Direct entry candidates admitted to the 200-level in agriculture programmes will spend a minimum of three academic sessions (3-year duration).

Graduation requirements
To graduate, a student shall have undergone three or four years of study depending on his/ her entry point, including six (6) months SIWES using second semester of 300 level and part of the vacation period. The activities of the SIWES period should include periodic seminars on the student's work as a way of stimulating interest as well as the presentation of a written report to be graded at the end of the year.

Course workload must meet the graduation requirements. Candidates admitted through the UTME mode shall have registered for at least a minimum of 120 units of courses for the four-year programme. Candidates must also have registered and passed all the compulsory courses specified for the programme.

The submission of an undergraduate project report based on supervised research is a graduation requirement, which must not be compromised. This requirement exposes the student to problem-solving techniques and provides him with an ability to organize ideas from literature and research findings. In short, it prepares the student for the work ahead and for further training at the postgraduate level.

Global course structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45

PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course code	Course title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	
ENT 211	Entrepreneurship and Innovation	2	C	15	45
AGR 201	Principles of Crop Production	2	C	30	-
AGR 202	Introduction to Agricultural Economics, Extension and Rural Sociology	2	C	30	-
AGR 203	Introduction to Forest Resources and Wildlife Management	2		30	-
AGR 204	Introduction to Animal Production	2	C	30	-
AGR 205	Introduction to Fisheries and Aquaculture	2	C	30	-
AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
	Total units	**16**			

300 Level

Course code	Course title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
HLM 301	Plant Propagation and Nursery Management.	2	C	15	45
HLM 302	Greenhouse Use and Management	2	C	15	45
HLM 304	Principles of Floriculture & Landscape Design	2	C	15	45
HLM 305	Statistics and Field Experimentation in Horticulture	2	C	15	45
HLM 306	Element of Landscape Agriculture	2			
HLM 307	Nursery/Seedling Production & Management	2	C	-	90
HLM 308	Ornamental gardening/Landscaping	1	C	-	45
HLM 309	Farm Mechanization & Workshop Practices	1	C	-	45
SOS 304	Soil fertility and laboratory	1	C	-	45

	techniques				
AGE 305	Farm Records and Accounting	1	C	-	45
CPS 307	Vegetables and Orchard crops Management	1	C	-	45
HLM 398	Field Practical Year Report	1	C	-	45
	Total units	**24**			

400 Level

Course code	**Course title**	**Units**	**Status**	**LH**	**PH**
HLM 401	Methods of Field Experimentation in Horticulture	3	C	15	45
HLM 402	Vegetable crops Production (Olericulture)	2	C	15	45
HLM 403	Fruit Trees Production (Pomology) New	2	C	15	45
HLM 404	Park and Garden Design & Management	2	C	15	45
HLM 405	Ornamental Gardening	2	C	15	45
HLM 406	Floricultural Crops Production & Decoration	2	C	15	45
HLM 407	Plant Materials, Landscape Design, Practise & Management	2	C	15	45
HLM 498	Seminar	2	C	-	-
HLM 499	Project	4	C	-	180
	Total units	**24**			

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students will be able to:

1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations; and
6. demonstrate an appreciable level of the art of public speaking and listening
7. write simple and technical reports.

Course Contents
Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times
2. list and identify the major linguistic groups in Nigeria
3. explain the gradual evolution of Nigeria as a political unit
4. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development
5. enumerate the challenges of the Nigerian State towards nation building
6. analyse the role of the judiciary in upholding people's fundamental rights
7. identify acceptable norms and values of the major ethnic groups in Nigeria
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents
Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people,; trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition,; citizenship and civic responsibilities; indigenous languages, usage, and development,; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation.; Re-orientation Strategies: Operation Feed the Nation (OFN), Green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-

Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

AGG 102: Introduction to Agriculture I (2 Units C: LH 30)

Learning Outcome

At the end of these lectures, students should be able to:

21. have a broad understanding of the concepts and dimensions of agriculture in modern times with emphasis on Nigeria and the tropics;
22. acquire basic knowledge and understanding of the roles of agriculture and the place of soil, crop and animal resources in the production process as well as the constraints they face;
23. be familiar with the role of technologies in the transformation of agriculture; and
24. explain potentials and constraints to sustainable agricultural production

Course Content

Meaning and Scope of Agriculture. Importance of Agriculture to an expanded economy. Agricultural Ecology. Genetics, Agronomy. Rocks and Soil formation. Soil and Water Conservation. Soil Fertility. Land Preparation methods (soil tillage systems). Soil-water-plant relationship. Plant Forms and functions, Growth, Development and Reproduction. Plant Propagation Methods. Cropping Systems, Planting Patterns and Plant Densities. Crop Husbandry, Pasture and Forage Crops. Floriculture, Weeds, Crop Diseases, Crop Pests, Forest management (Silviculture), Crop Improvement, Animal Production, Forms and classification of major farm animals in West Africa, General terminology in animal production, Anatomy and physiology of farm animals, Reproduction in farm animals, Animal Nutrition, Livestock Management, Animal Health, Fisheries and Wildlife, Bee-keeping (Apiculture), Animal Improvement.

AGG 112: Introduction to Agriculture II (1 Unit C: LH 15)

Learning Outcome

At the end of these lectures, students should be able to:

16. Explain the history of agricultural development and the role of the public and private sectors.
17. Identify and analyse the factors of agricultural production and the role of various resources
18. Explain constraints of technology and mechanization, and the role of agricultural extension transformation.

Course Contents

History of Agricultural Development in West Africa, Roles of Government and NGOs in Agricultural Development, Factors of agricultural production, Basic Economic Principles, Characteristic Features of Agricultural Production, Labour Management, Farm Management, Marketing of Agricultural Produce, Agricultural Extension, Agricultural Technology, Farm surveying and farmstead planning, Simple Farm Tools, Farm machinery and implements, Mechanization and sources of farm power, Processing and storage, Introduction to biotechnology, Application of ICT in agriculture, Introduction to agricultural research and statistics.

BIO 101: General Biology I (2 Units C: LH 45)

Learning Outcomes

At the end of lectures, students should be able to:

1. explain cell structure and organisations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents

Cell structure and organization. Functions of cellular organelles. Characteristics and classification of living things. Chromosomes, genes and their relationships and importance. General reproduction. Interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism). Heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms), elements of ecology and types of habitats.

BIO 102: General Biology II (2 Units C: LH 45)

Learning Outcomes

At the end of the lectures, students should be able to:

1. state the unique characteristics of plant and animal kingdoms;
2. describe ecological adaptations in the plant and animal kingdoms;
3. give a summary of the physiology of plants and animals;
4. explain nutrition, respiration, excretion and reproduction in plants and animals; and
5. describe growth and development in plants and animals.

Course Contents

A generalized survey of the plant and animal kingdoms based mainly on study of similarities and differences in the external features, ecological adaptations of these forms. Briefs on physiology to include nutrition, respiration, circulatory systems, excretion, reproduction, growth, and development.

BIO 107: General Biology Practical I (1 Unit C: PH 45)

Learning Outcomes

At the end of the lectures, students should be able to:

1. outline common laboratory hazards
2. provide precautions on laboratory hazards
3. state the functions of the different parts of microscope
4. use the microscope and describe its maintenance
5. draw biological diagrams and illustrations
6. apply scaling and proportion to biological diagrams

Course Contents
Common laboratory hazards: prevention and first aid. Measurements in biology. Uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration; scaling, accuracy, and proportion. Use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101.**

BIO 108: General Biology Practical II (1 Unit C: PH 45)

Learning Outcomes
At the end of the lectures, students should be able to:
1. describe the anatomy of flowering plants;
2. differentiate types of fruit and seeds;
3. state ways of handling and caring for biological wares;
4. describe the basic histology of animal tissues; and
5. identify various groups in the animal kingdom.

Course Contents
Anatomy of flowering plants. Primary vegetative body: stem, leaf, and root to show the mature tissues namely parenchyma, collenchyma, sclerenchyma, xylem, and phloem. Types of fruits and seeds. Care and use of dissecting kits and other biological wares. Dissection and general histology of animal tissues based on vertebrate forms. Morphology and functions of epithelial, muscular, nervous, and connective tissues. Examination of various groups of lower invertebrates under microscopes. Identification of various groups of organisms in animal kingdom, and any experiment designed to emphasise the practical aspects of topics in BIO 102.

CHM 101: General Chemistry I (2 Units C: LH 45)

Learning Outcomes
After studying all materials and resources presented in the course, the student will be able to:
1. define atom, molecules, and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionisation energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation–reduction equations and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridised orbitals;
7. identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure, and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy; and
10. determine rates of reactions and their dependence on concentration, time, and temperature.

Course Contents
Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence, forces, structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reactions, equilibrium, and thermodynamics. Acids, bases, and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II (2 Units C: LH 45)

Learning Outcomes
At the end of this course, students will be able to:
1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of transition metals.

Course Contents
Historical survey of the development and importance of organic chemistry. Fullerenes as fourth allotrope of carbon. Uses as nanotubules, nanostructures, nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanisms and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, students will be able to:
1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. tell the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents
Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, students will be able to:
1. identify the general laboratory rules and safety procedures
2. collect scientific data and correctly carrying out Chemical experiments
3. identify the basic glassware and equipment in the laboratory
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds
5. execute solubility tests on known and unknown organic compounds
6. execute elemental tests on known and unknown compounds
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents
Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

MTH 101: Elementary Mathematics I (2 Units C: LH 30)
(Algebra and Trigonometry)

Learning Outcomes
At the end of the course students will be able to:
1. understand basic definition of set, subset, union, intersection, complements and use of venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. understand various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents
Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition, and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Learning Outcomes
At the end of the course students should be able to:
1. understand types of rules in differentiation and integration;
2. understand the meaning of function of a real variable, graphs, limits, and continuity; and

3. solve some applications of definite integrals in areas and volumes.

Course Contents
Function of a real variable, graphs, limits, and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; integration as an inverse of differentiation. Methods of integration, definite integrals. Application to areas and volumes.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes
On completion, the student will be able to:
1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems based on the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents
Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton laws of motion (inertial frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes, and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits.

PHY 102: General Physics II (Electricity & Magnetism) (2 Units C: LH 30)

Learning Outcomes
On completion, the student should be able to:
1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters;

8. determine the characteristics of AC voltages and currents in resistors, capacitors, and inductors.

Course Contents
Forces in nature; electrostatics, electric charge and its properties, methods of charging, Coulomb's law and superposition, electric field and potential, Gauss's law, capacitance, electric dipoles, energy in electric fields, conductors and insulators, current, voltage and resistance, Ohm's law and analysis of DC circuits. Magnetic fields; Lorentz force, Biot-Savart and Ampère's laws, magnetic dipoles, dielectrics, energy in magnetic fields, electromotive force, electromagnetic induction, self and mutual inductances, Faraday and Lenz's laws. Step up and step down transformers: Maxwell's equations, electromagnetic oscillations and waves, AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

PHY 107/108: General Physics Practical I & II (2 Units C: PH 90)

Learning Outcomes
On completion, the student will be able to:
1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors; and
4. plot and analyse graphs, draw conclusions from numerical and graphical analysis of data.

Course Contents
This introductory course emphasises quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

200 Level

GST 212. Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes
A student who has successfully gone through this course should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents
Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents
Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

AGR 201: Principles of Crop Production (2 Units C: LH 30)

Learning Outcomes
Students will be equipped with:
1. basic agronomic terminologies;
2. knowledge of and basis of crop distribution across climatic regions;

3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification; and
5. knowledge of soil management needs and some conservation practices.

Course Contents
Definitions of the terms, crops and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.). Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies.
Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.

AGR 202: Introduction to Agricultural Economics, Extension and Rural Sociology (2 Units C: LH 30)

Learning Outcomes
At the end of the course students will be able to:
1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents
The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology.

Importance of rural communities and institutions, social stratification, social processes, and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques and strategies of change. Agricultural extension teaching methods, aids, and their use.

AGR 203: Introduction to Forest Resources & Wildlife Management (2 Units C: LH 15; 45 PH)

Learning Outcomes

The students will be able to:

1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and
5. raise seedlings of economic tree species.

Course Contents

Renewable natural resources availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria. Silviculture, afforestation characteristics of major timbers and their uses. Forest production activities. Forest protection. Regulation of harvests for sustained yield. Importance of forestry and wildlife to the national economy. Practical approach to apiculture, snailery, cane rat farming and other forest enterprises.

AGR 204: Introduction to Animal Production (2 Units C: LH 30)

Learning outcomes

At the end of the course, the students are expected to have known the following:

1. prospects and problems of the animal industry;
2. identification/description of types of farm animals;
3. feeds and feeding management of farm animals;
4. housing and management systems of different livestock;
5. principles of animal health management;
6. animal breeding and breed improvement principles; and
7. basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc).

Course Contents

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production, feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and rabbits). Introduction to game and companion animals; general principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation Anatomy and physiology of the cell, tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses, and other systems of farm animals.

AGR 205: Introduction to Fisheries and Aquaculture (2 Units C: LH 30)

Learning outcomes

At the end of this course, students will be able to:

1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

Course Contents

Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological, economic, and cultural importance of fisheries park, zoo, sport fishing, marine park, etc. Scope of fisheries and aquaculture.

AGR 206 Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: LH 30)

Learning Outcomes

At the end of this course students should be able to:

1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;
8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

Course Contents

Philosophy, scope, objectives and historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Programme approaches in family and consumer sciences which will help meet these needs. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post- harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food; factors contributing to texture, colour, aroma, and flavour of food. Cost, traditional and ethnic influence of food preparation and consumption pattern.

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflicts and violence;
3. differentiate between conflict and terrorism; enumerate security and peace building strategies; and
4. describe roles of international organisations, media, and traditional institutions in peace building

Course Contents

Concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes and rivalries. Economic inequalities, social disputes, nationalist movements and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises; conduct entrepreneurial marketing and e-commerce;
7. apply a wide variety of emerging technological solutions to entrepreneurship; and
8. appreciate why ventures fail due to lack of planning and poor implementation

Course Contents
Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies).

HLM 301: Plant Propagation and Nursery Management (2 Units C: LH 15; PH 45)

Learning outcomes
The students will be able to:

1. discuss the importance of a nursery in crop establishment;
2. identify materials and site requirements for establishing a nursery; and
3. operate a small nursery.

Course Contents
Importance and basic types of plant propagation in horticulture. Plant propagation structures, media, and containers. Partial soil sterilisation. Seed germination, viability, and dormancy. Sowing seeds in containers, seed beds and directly in the field. Advantages, disadvantages, and methods of vegetative propagation. Anatomical and physiological basis of propagation by cuttings. Types of cuttings: stem, leaf, leaf bud, root cuttings, etc. Use of plant growth

regulators. Care of cuttings during and after rooting. Reasons for grafting and budding. Graft and bud union formation. Graft incompatibility. Stock scion relationships. Methods of grafting and budding. Physiological basis of propagation by layering. Types of layering. Other vegetative structures used for propagation.

HLM 303: Greenhouse Use and Management (2 Units C: LH 15; PH 45)

Learning Outcomes

The course will equip the students with adequate knowledge of:

1. the Greenhouse and their uniqueness in horticulture;
2. the factors of importance in the location of a greenhouse;
3. construction, operation, and management of a greenhouse;
4. optimization of greenhouse environment for special crop production; and
5. the knowledge of hydroponics system and fertigation in the green house environment.

Course Contents

Principles and practices of greenhouse operation, overview of world and local greenhouse industry, greenhouse structures and plant growing systems, irrigation and fertilization management using containers and soilless media, pest and disease management, soils, fertilizers, potting, watering, and ventilating. Principles and practices involved in the production of horticultural crops in the greenhouse. Hydroponics culture and the production of selected fruit, vegetable, and ornamental plants in hydroponics systems.

HLM 304: Principles of Floriculture & Landscape Design (2 Units C LH 15; PH 45)

Learning Outcomes

At the end of the course, students will be able to:

1. explain the concept of landscaping and floriculture;
2. discuss landscape survey and analyses principles; and
3. identify ornamental plants and discuss trends in their utilization.

Course Contents

Definition of floriculture and landscape. Introduction to historical background of landscape. Concepts of landscape. Contour identification and alteration. Landscape surveys: principles and practices of identifying, analysing, and recording landscape resources. Ornamental trees, shrubs, and ground cover plants for aesthetic effects. Physiology and metabolism of floricultural crops during their development from seeds and vegetative materials through flowering. Modern trends in the cultivation and utilization of flowers, world trade in flowers and the implication for action in floricultural development in Nigeria.

HLM 305: Statistics and Field Experimentation in Horticulture (3 Units C, LH 15; PH 45)

Learning Outcomes

At the end of this course, students will be able to:

1. estimate frequency distribution, measures of location and measures of dispersion,
2. compute normal and binomial distribution,

3. perform sampling operation, data collection, data processing techniques, statistical inference, tests of hypothesis: F-test, T-test, Chi-square,
4. estimate analysis of variance, analysis of covariance, correlation and regression analysis. Goodness of fit, and
5. formulation of research objectives, perform field experimentation, collection and processing of data.

Course Contents

Basic concepts of statistics. Frequency distribution, measures of location, measures of dispersion. Probability distribution. Normal and binomial distribution. Sampling data collection, data processing techniques, statistical inference, tests of hypothesis – F-test, T-test, Chi-square. Analysis of variance, analysis of covariance, correlation and regression analysis. Goodness of fit. Formulation of research objectives, field experimentation, collection and processing of data.

HLM 306: Element of Landscape Agriculture (2 Units C: LH ; PH)

HLM 301: Nursery/Seedling Production & Management (2 Units C: PH 90)

Learning Outcomes

At the end of the practical year the students should have acquired the skills to set up and manage a nursery.

Course Contents

Definition of nursery and nursery practices, types of nurseries, open land nursery and greenhouses/glasshouses. Seed germination, vigour of seedlings, crop establishment – seed bed preparation, seed sowing techniques, and large nursery. Reasons for starting plants in the nursery, factors to consider in establishing a nursery, Transplanting methods, maintenance of seedlings in the nursery – watering, pest control, soil fertility management, etc.

HLM 302: Ornamental/Landscaping (1 Units C: PH 45)

Learning Outcomes

At the end of the practical year, the students should have acquired the skills to set up and manage a floral garden as well as undertake landscape projects.

Course Contents

During the one-year duration of ornamental/landscaping experience, the student is trained on identification of different ornamental plants, establishment of ornamental gardens, propagation techniques using seeds, bulbs, softwood and hardwood cutting; identification of different landforms, and employability skills in floral arrangement for aesthetic purposes (landscaping), cut flower production and entrepreneurial skill in flora production for export.

HLM 303: Farm Mechanization & Workshop practices (1 Units C: PH: 45)

Learning Outcomes

The students should be able to:

1. explain the goals and principles of agricultural mechanization
2. define and demonstrate capacity on mechanization of agricultural practices

3. perform land clearing felling and stumping, and ploughing, tillage operations (ridging and harrowing); planting/sowing operations, herbicides/pesticides, and fertilizer distribution operations.

Course Contents
Goals and principles of agricultural mechanization. Basic mechanics: force, distance, time, velocity, scalar and vector quantities, etc. Principles of two and four stroke engines; internal combustion engines, electric motors. Farm power transmission lines. Importance of mechanization of agricultural practices: from the field to the table. On-site experience of land preparation operations and equipment used. Land clearing (felling and stumping), and ploughing, tillage operations (ridging and harrowing); planting/sowing operations, herbicides/pesticides, and fertilizer distribution operations. Harvesting, handling and transport operations. Agricultural produce processing and storage operations and preservation, including safety in use of preservatives. Livestock machines and equipment, automated food conveyors, milking, watering and meat processing and canning. Harvesting, handling and transport operations.

SOS 304: Soil Fertility, Field & Laboratory Techniques (1 Units C: PH 45)

Learning Outcomes
At the end of the course students should be able to:

1. understand the importance of soil diagnosis;
2. gained from on-hand practice of laboratory activities;
3. get fully exposed to the functionality of each of the instruments/equipment (ranging from weighing balances to Atomic Absorption Spectrophotometer) used for soil, water and plant analyses; and
4. understand Ethical considerations in the management of Laboratories, including simple maintenance of integrity of laboratory instruments and equipment.

Course Contents:
Soil and plant tissue samples preparation, processing and laboratory procedures. Theories and procedures for chemical analysis of soil and plant materials. Routine methods for Soil pH determination, Soil mechanical analysis (Hydrometer method), Determination of Organic carbon (Walkley-Black method), Exchangeable acidity (Titration method) Determination of Exchangeable Cations (Ca, Mg., K., Na., Mn., and Effective CEC), Available P (Bray 1 and Olsen's methods), Total N (Regular Macro-Kjeldahl) and Determination of Nitrates in soils. Selected Methods of Soil analysis. Plant Analysis**:** Determination of Total N **(**Micro-Kjeldahl method), Perchloric Acid digestion (Wet Oxidation) of plant materials for P., Ca., Mg., Fe., Mn., Zn., and Cu. Digestion of plant material using aluminium Digestion block. Determination of Ca., Mg., K., and P. In Plant Tissue (Dry Ashing). Colorimetric determination of P in plant tissue (Vanado-Molybdate method), Nitric-perchloric acid digestion of plant material for S analysis (Aluminium block method) and Colorimetric determination of Nitrate in plant tissue. Principles of instrumentation. Operations and maintenance of major analytical instruments; flame photometer, calorimeter, spectrophotometer, photometers, amino acid analyzers, IRU UVR, pH meters, conductivity bridges, gas systems for monitoring analytical procedures. Laboratory

safety. **Data organization**, data analyses, data interpretation. Measures for accuracies and precision in the management of data for presentation.

AGE 304: Farm Records and Accounting (1 Unit C: PH 45)

Learning Outcomes
At the end of the course, the students should be able to:
1. apply the knowledge and skills acquired from the principles and theories taught at the lower levels at the different Industrial training locations or farms where their practical training is situated;
2. prepare formats for different farm records such as production, sales, inventory etc.; and
3. analyze and interpret organizational financial performance from their financial records.

Course Contents
Objectives of records and accounts. Types of records. Importance of production records. Analysis of farm records. Farm inventory-valuation and depreciation. Farm financial accounts. The farm as a firm.

CPS 307: Vegetable and Orchard Crops Management (1 Units C: PH 90)

Learning Outcomes
1. Learners should have acquired adequate skill for vegetable crop production as an enterprise; and
2. Interest arousal in orchard and plantation crops establishment,

Course Contents
Vegetable seeds viability testing, vegetable nursery establishment and management.
Orchard crops propagation techniques; transplanting and raising of specific vegetable crops to harvesting stage. Acquisition of skills in orchard management using an existing orchard of any fruit tree.

HLM 398: Report Writing (1 Units C: PH 45)

Learning Outcome
At the end of the course, students will be able to write a report of the practical year activities and demonstrate the ability to present it.

Course Contents
Scientific writing and farm record practices. Submission of overall report on practical year/Students Industrial Work Experience Scheme (SIWES).

400 Level

HLM 401: Methods of Field Experimentation in Horticulture (3 Units C: LH 30; PH 45)

Learning Outcomes

1. At the end of the course, learners should understand the concept experimentation, its purpose, and procedure; and
2. They should have a bit of the knowledge of data collection, collation, and analysis.

Course Contents

Principles of field experimentation in various Horticultural crops. Research methodology; experimental plot layout and experimental designs, field survey; normal distribution and sampling; measurements and data analysis. Sources of variation in field experiments. Single factor and factorial experiments. Analysis of variance, data transformation and means separation. Data collation and interpretation. Concept of mean, standard deviation, standard error, least significant difference, Duncan's multiple range test. Result presentation in tables and figures should cover the various Horticultural crops.

HLM 402: Vegetable Crops Production (Olericulture) (2 Units C: LH 15; PH 45)

Learning Outcomes

AThe course will equip the students with entrepreneurial skills in vegetable production through learning of

1. the scope of the olericulture industry, and the benefits that this industry provides;
2. grouping of vegetable crops for food and economic gains;
3. the influence of the environment on the growth of vegetable crops.

Course Contents

Concept of vegetable crops production. Economic importance of vegetable crops. Major types of vegetable crops - indigenous, exotic, and wild vegetables. Principles and practice of vegetable crops production. Factors (climatic and soil requirements) influencing site selection, establishment, production, and management. Ecological distribution of vegetables and fruits in Nigeria. Methods of propagation. Nursery system and factors affecting it. Varieties and adaptation of exotic vegetables and fruits to the Nigerian environment. Production practices, diseases and pests, harvesting, handling, processing, storage, and marketing opportunities.

HLM 403: Fruit Trees Production (Pomology) (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. understand the distribution of fruits in relation to ecological zones of Nigeria;
2. explain the production practices of major and minor tropical fruit tree crops; and
3. learn orchard layout and management of fruit trees.

Course Contents

The present state of tropical fruits growing, nutritional considerations, social and economic factors, climate in relation to tropical fruit growing, soil and fertilizers, tropical vegetation. Origin and distribution, soil and climatic requirements, production practices, harvesting and storage, marketing of mango, citrus, pawpaw, banana and plantain, pineapple and other minor tropical and temperate fruits.

HLM 404: Park & Garden Design & Management (2 Units C: LH 15; PH 45)

Learning outcomes
At the end of the course, students will be able to:
1. explain the concepts of parks and garden planning and design process;
2. differentiate the categories of gardens; and
3. perform garden design and management.

Course Contents
History and types of gardens. Architectural design for local and modern parks and gardens. Functional designs for parks and gardens, such as, parks for family relaxation, parks for holidaying. Concept of national parks and gardens, botanical gardens, horticulture gardens, estate gardens, etc. Contracts and contractual agreements in parks and garden design and management. Establishment and management of parks and gardens. Garden and park facilities and maintenance. Relationships between parks/gardens and tourism. Field trip is required.

HLM 405: Ornamental Gardening (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, students will be able to:
1. explain the functional uses of ornamental plants on the landscape; and
2. identify tropical ornamental plant species and discuss their uses.

Course Contents
Theory and practice of planting and maintaining ornamental plants in public and private landscaped areas. The functional use of ornamental woody plants, flowers, and turf in the landscape. Identification of tropical ornamental plants. Culture of trees shrubs and flowers. Shade trees, ground covers, annual, biannual, and perennial shrubs, and plants. Bedding and foundation flower plant, lawn grasses. Nursery establishment and management. Palms as ornamental plants, rock gardens, aquatic plants, and different types of orchids, Flower Album.

HLM 406: Floricultural crop Production and Decoration (2 Units C: LH 15; PH 45)

Learning outcomes
The course will equip the students with the:
1. technique of growing house plants, pot plants and cut flowers;
2. knowledge of major cut flowers in their locality;
3. knowledge of growing and managing floricultural crops on the field and in protected environment; and
4. use of flowers for decorations.

Course content
Floriculture as flower farming. Classification of ornamental plants. Bedding plants, house plants, pot plants and Cut flower and cut flower industry. Flower production techniques – media for growing ornamental plants (cell packs, trays, hanging baskets etc.). Structures for growing ornamental plants. Greenhouse and screen house for floricultural plan production. Production of flowers covering environmental requirement, propagation methods, management, harvesting

and post-harvest handling. Marketing of ornamental plants, local and international trade in cut flowers. Local and exotic ornamental plants to include roses, orchids, begonia etc. Practical exposure to commercial florist and interior decoration outfits.

HLM 407: Plant Materials and Landscape Design (2 Units: LH 15; PH 45)

Learning Outcomes:

The students will learn how to select materials for landscape development from:

1. Plant communities of their localities;
2. Cultural requirements of the flora; and
3. Learn to put the plants to aesthetic use.

Course Content

Ecological principles, study of plant communities, biogeography; identification of native flora and perennials and other native species, evergreens, and exotics; uses of plants and grasses in the landscape and planting design projects. Emphasis on the place of herbaceous flowers in the landscape and their cultural requirements and uses; the planning of perennial borders for continuous bloom; and survey of some of the genera contributing importantly to our flowers gardens. Field trips required.

SOS 498: Final Year Seminar Report (1 Units C: LH 15)

Learning Outcomes

At the end of the second semester in final year of study, our students should be able to:

1. write organized essays, scientific writing following acceptable logical sequences;
2. review existing body of knowledge and current literature, sifting relevant results/findings from such articles from irrelevant parts, appreciating limitations and gaps inherent in such articles and using such information in formulating, and developing both null and alternative hypothesis for future works.

Course Contents

A comprehensive report on a topic in hurticulture or any other course with the agriculture programme. The seminar topic shall be presented in any structure or format suitable for the detailed discourse of the topic under the supervision of a lecturer assigned to do that, as routine academic work.

SOS 499: Final Year Research Project (4 Units C: PH 180)

Learning outcomes

At the end of the course, students will be able to:

1. develop an inquisitive mind, an analytical mind, a problem-solving and due-diligence disposition in the solving problems militating against agricultural soils' productivity and agricultural development in the country;
2. develop high reasoning capacity into agronomic problems of economic importance to the society is developed in the students as he/she introduces his/her identified constraints; ability to acknowledge past research efforts and past results and findings and unresolved issues are recorded in the literature reviews section;

3. acquire the capacity to assemble appropriate tools/instruments, following appropriate procedures/ways and means, as well as the materials needed to carry out reproducible and verifiable data are detailed in the Materials and Methods section;
4. present the results and discussion section, and learn how to organize experimental data, learn the science of logic in the use of statistics, statistical deductions and inferences, as well as significance levels, learn rationale thinking and reasoning in interpretation of data and comparative analysis; and
5. learn how to confirm/accept and/or refuse/reject original hypothesis (null and alternative) in their concluding sections.

Minimum Academic Standards
Laboratory and Equipment Requirements

Relevant teaching/laboratory equipment include overhead projectors, slide projectors, projection screens and other audio-visual aids, weighing balances, centrifuges, colorimeters, spectrometers, pH meters, microscopes, incubators, refrigerators, deep freezers, ovens, autoclaves, water bath and distillation unit, chambers, and moisture meters. Others include Atomic Absorption Spectrophotometers (AAS), amino acid analysers, digestion units, extractors, systems, ashing equipment, transfer chambers, electronic calculators, and microcomputers.

Basic farm equipment should include tractors, trailers, ploughs, harrows, ridgers, planters, harvesters, sprayers, shellers, processing equipment and in certain conditions, irrigation facilities.

Resource standards

Academic staff

The guidelines on academic staff/student ratio of 1:15 for agriculture programmes shall apply. To start any programme in agriculture, there should be a minimum of six academic staff. There is need to have a reasonable number of staff with PhD degrees accounting for at least 70% of the total number and having adequate teaching experience for every programme in the discipline.

Administrative support staff

The services of administrative support staff are indispensable in the proper administration of a department; it is important to recruit very competent, computer literate senior staff.

Technical support personnel

The services of technical support staff, which are indispensable in the proper running of laboratories and workshops, are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance.

Spaces

The NUC recommends the following physical space requirement

		m^2
Professor's office	-	18.50
Head of department's office	-	18.50
Tutorial teaching staff's office	-	13.50

Other teaching staff space	-	7.00
Technical staff space	-	7.00
Secretarial space	-	7.00
Science staff research laboratory	-	16.50
Seminar space/per student	-	1.85
Laboratory space per FTE	-	7.50

Library and information resources

The department should have a library with relevant collections comprising current hardcopies of reference, journals and other textual materials. There should also be available network of wireless facilities (Wifi) with adequate bandwidth to enhance access to the electronic resources.

Laboratory equipment

1. Atomic absorption spectrophotometer (AAS)
2. 20 desktop computers for teaching purposes.
3. Greenhouse/ Screen house for protected cultivation facility
4. Audio visual aids /studio
5. Leaf area meter
6. Plant samples grinding machine (with stainless metal)
7. 10-15 microscopes (for large classes)
8. Weighing balances as appropriate for the department
9. Moisture meters
10. Deep freezers and refrigerators
11. Nutrient analyzer
12. pH-meter w/articulated arm
13. Fume cupboard
14. Light meter

Other resources/equipment

Vehicles

At least two lorries, two 4-wheel drive vans, two 50-seater buses, two station wagons and two tractors with complete accessories in a pool for the entire faculty/college and one saloon and station wagon for the dean's office.

Workshop

Workshop for training students in machine and the maintenance of farm equipment parts and other engineering practical materials must be provided preferably on the university's teaching/research farm in adequate numbers based on the user space areas of about 15 m^2/FTE student to accommodate machinery, equipment, and students.

Culture rooms

Culture rooms would be needed for tissue culture studies, production of mushrooms etc.

Sheds

Sheds are required for major repairs and servicing of farm equipment as well as their storage.

Landscape management component

1. Nursery, gardening & equipment
2. Landscape design workshop/studio (well equipped)
3. Landscape survey equipment Cameras
4. Turfgrass type collection & farm layout
5. Drawing/Drafting tables, stools, pens, papers, pencils, etc.
6. Photo/printing studio or darkroom
7. Landscaping Software

B.Sc. Soil Science

Overview

The core curriculum and minimum academic standards (CCMAS) in soil science reflect our collective responses to the fast-advancing frontiers of knowledge and research in all sub-specialization areas of soil science discipline.

The document is presented in two major segments: the core curriculum segment, including the philosophy and principles behind the study of soil science; the objectives of the training modules, employability and 21st century skills emphasized and the unique features of the programme as well as the admission and graduation requirements for a programme in soil science. The foregoing is closely followed with a tabulated global course structure and learning outcomes from detailed course contents.

In the second segment are presented minimum standards for equipment, staffing (academic and non-academic), library and for classrooms, laboratories, clinics, workshops and offices.

Philosophy

The philosophy behind the development of the core curriculum and minimum academic standards in soil science is predicated on two facts:

1. Teachers of soil science in Nigerian universities would need the highest academic and professional standards for imparting 21st century knowledge and skills that will in turn empower graduates of soil science with requisite training for purposes of making enlightened policies and practices for the ultimate benefit to mankind; and
2. Soils are important and the bedrock of agriculture; that soils feed the plants that feed us; the soil, not oil, holds the future for humanity; and fertile and productive soils provide the keys to the feeding of the projected eleven (11) billion world population by the year 2050.

Objectives

The overall objectives are to:

1. produce skilled manpower adequately equipped with the comprehensive knowledge of the science and knowledge of the science and technology (in Agricultural Economics, Animal Science, Crop Science, Soil Science and Land Management), underpinning the soil as the bedrock of agriculture; the natural resource that feeds the plants that feed us and as the living system required in economic production of food and fibre for the society at large;
2. inculcate in our graduates the acumen for innovation, creativity, and entrepreneurship in as much as are possible all aspects of soil science as the medium for crop-plant growth and development;
3. produce adequate manpower that will engage in direct production and conduct research in all other facets of agricultural production, extension and rural development along with judicious management of human resources, fund, natural resources and equipment; and
4. assist the nation in her efforts at achieving self-sufficiency in the production of basic food and agricultural raw materials needed to support the growth of industries in the country.

Unique features of the programme

1. Presentation of the soil science core sub-specialization branches of soil science course in a modularized structure for easier delivery by the teachers and better appreciation and understanding by the students.
2. Unbundling all aspects and/or sub-specialization branches of soil science as an applied earth science, agricultural science and/or environmental science.

3. Inclusion of "Learning outcomes" from each of the taught soil science courses within the hitherto "Stand-alone" core sub-specialization courses in line with international best practices and for appropriateness and sustainability.

Employability skills

Graduates of this programme shall possess:

1. Capacity to implement chain surveying proposed farm sites, cutting of full perimeter traverses, sinking of soil profiles, sampling such profile pits and surface soils (the upper strata of geological formations), and analysing such samples in the laboratories, all geared towards self-employment; and statistically analyse data to enable appropriate inferences and deduction, all geared towards self-employment;
2. Capacity to utilise soils data in combination with data of air and water quality as well as determinant physiographic features of land forms, commencing in land surveying, air quality assessment and water analysis, sinking profiles, sampling the soils and analysing such samples in the laboratories, conduct environmental impact assessments for emerging industries; and,
3. Skills and ability to carry out basic study, conduct basic and applied researches and investigations on the soils, as a medium of plant growth and development, as the bedrock of agriculture.

21st Century skills

1. Critical thinking,
2. Creativity
3. Collaboration
4. Communication
5. Information literacy
6. Media literacy
7. Technology literacy
8. Flexibility
9. Leadership
10. Initiative
11. Productivity
12. Social skills

Admission and Graduation Requirements

Admission Requirements

Candidates are admitted into the degree programmes in soil science following three ways:

1. The Unified Tertiary Matriculation Examination (UTME); and
2. Direct entry

UTME- Four Year Degree Programme

In addition to acceptable passes in UTME, candidates must obtain credit level passes in the Senior Secondary Certificate examination (SSC) in five subjects including English Language, Mathematics, Chemistry, Biology or Agricultural Science at a maximum of two sittings. Candidates must also have at least a pass in Physics.

Direct entry mode

Candidates must have at least 2 credit passes in Advance level Chemistry and Biology in addition to 3 SSC-credit passes prescribed for UTME entry mode. Holders of ND and HND in Agriculture and related field with a minimum of Lower Credit are eligible for consideration for admission into 200-Level. Agriculture

Minimum duration

The minimum duration for programme is 4 academic sessions (4-year duration) for candidates who entered through the UTME Mode. Direct Entry candidates admitted to the 200-level in Agriculture programmes will spend a minimum of 3 academic sessions (3 year duration)

Graduation Requirements

To graduate, a student shall have undergone 3 or 4 years of study depending on his/ her entry point.

Course workload must meet the graduation requirements. Candidates admitted through the UTME mode shall have registered for at least a minimum of 120 units for the 4-year–and 90 units for direct entry programme in Agriculture and in other programmes as indicated under course requirements. Candidates must also have registered and passed all the compulsory courses specified for the programme.

The submission of an undergraduate project report based on supervised research is a graduation requirement, which must not be compromised. This requirement exposes the student to problem-solving techniques and provides him with an ability to organize ideas from literature and research findings. In short, it prepares the student for the work ahead of graduation and for further training at the postgraduate level. This area of academic preparation needs to be maintained and developed further.

Global Course Structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45

Total	**26**			

200 Level

Course Code	Course title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	15	45
AGR 201	Principles of Crop Production	2	C	30	
AGR 202	Introduction to Agric. Economics, Extension and Rural Sociology	2	C	30	-
AGR 203	Introduction to Forest Resources and Wildlife Management	2	C	30	-
AGR 204	Introduction to Animal Production	2	C	30	-
AGR 205	Introduction to Fisheries and Aquaculture	2	C	30	-
AGR 206	Principles of Family and Consumer Sciences, Food Science and Technology	2	C	30	-
WMA 201	Agro-Meteorology, Biogeography and Climate Change	2	C	15	45
SOS 207	Principles of Soil Science	2	C	30	45
	Total units	**20**			

300 Level

Course Code	Course title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	15	45
ENT 312	Venture Creation	2	C	15	45
SOS 301	Soil Chemistry and Soil Microbiology	2	C	15	45
SOS 302	Introduction to Agric. Mechanization	1	C	15	45
SOS 303	Pedology and Soil Physics	2	C	15	45
SOS 304	Soil and Water Conservation and Management	2	C	15	45
SOS 305	Basic Statistics and Experimental Designs for Agriculture	2	C	30	-
SOS 306	Introduction to Application of Computer in Soil Science	2	C	15	45
SOS 307	Soil fertility Management and Plant Nutrition	2	C	15	45
	Total units	**17**			

400 Level

Course Code	Course title	Units	Status	LH	PH
SOS 401	Soil Survey, Classification and Land Use Planning	2	C	15	45
SOS 402	Soil Fertility Management and Plant Nutrition	2	C	15	45

SOS 403	Soil Irrigation and Drainage	2	C	15	45
SOS 404	Soil Physics and Hydrology	2	C	15	45
SOS 405	Fertilizers, Fertilizer Manufacture and Fertilizer Use	2	C	15	45
SOS 406	Soil Chemistry and Mineralogy	2	C	15	45
SOS 407	Soil Testing and Plant Tissue Analysis	2	C	15	45
SOS 408	Research Methods and Scientific Writing	1	C	15	-
SOS 409	Soil Biology and Biochemistry	2	C	30	45
SOS 498	Final Year Seminar	1	C	-	45
SOS 499	Final Year Research Project	4	C	-	180
	Total units	**22**			

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English Language;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports

Course Contents

Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and Usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation, and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing, and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension

strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building; and
6. analyse the role of the judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. List and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups).Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria).Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence).Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war).Concept of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigeria people, trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual norms and values (basic Nigeria norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage and development; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values The 3R's – Reconstruction, Rehabilitation and Re-orientation. Re-orientation strategies: Operation Feed the Nation (OFN), green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), mass mobilization for self-reliance, social justice and economic recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

AGG 102: Introduction to Agriculture I (2 Units C: LH 30)

Learning Outcome

At the end of these lectures, students should be able to:

1. have a broad understanding of the concepts and dimensions of agriculture in modern times with emphasis on Nigeria and the tropics;
2. acquire basic knowledge and understanding of the roles of agriculture and the place of soil, crop and animal resources in the production process as well as the constraints they face;
3. be familiar with the role of technologies in the transformation of agriculture; and
4. explain potentials and constraints to sustainable agricultural production

Course Content
Meaning and Scope of Agriculture. Importance of Agriculture to an expanded economy. Agricultural Ecology. Genetics, Agronomy. Rocks and Soil formation. Soil and Water Conservation. Soil Fertility. Land Preparation methods (soil tillage systems). Soil-water-plant relationship. Plant Forms and functions, Growth, Development and Reproduction. Plant Propagation Methods. Cropping Systems, Planting Patterns and Plant Densities. Crop Husbandry, Pasture and Forage Crops. Floriculture, Weeds, Crop Diseases, Crop Pests, Forest management (Silviculture), Crop Improvement, Animal Production, Forms and classification of major farm animals in West Africa, General terminology in animal production, Anatomy and physiology of farm animals, Reproduction in farm animals, Animal Nutrition, Livestock Management, Animal Health, Fisheries and Wildlife, Bee-keeping (Apiculture), Animal Improvement.

AGG 112: Introduction to Agriculture II (1 Unit C: LH 15)
Learning Outcome
At the end of these lectures, students should be able to:
1. Explain the history of agricultural development and the role of the public and private sectors.
2. Identify and analyse the factors of agricultural production and the role of various resources
3. Explain constraints of technology and mechanization, and the role of agricultural extension transformation.

Course Contents
History of Agricultural Development in West Africa, Roles of Government and NGOs in Agricultural Development, Factors of agricultural production, Basic Economic Principles, Characteristic Features of Agricultural Production, Labour Management, Farm Management, Marketing of Agricultural Produce, Agricultural Extension, Agricultural Technology, Farm surveying and farmstead planning, Simple Farm Tools, Farm machinery and implements, Mechanization and sources of farm power, Processing and storage, Introduction to biotechnology, Application of ICT in agriculture, Introduction to agricultural research and statistics

BIO 101: General Biology I (2 Units C: LH 45)

Learning outcomes
At the end of lectures, students should be able to:
1. explain cell structure and organizations;
2. summarize functions of cellular organelles
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents
Cell structure and organization, functions of cellular organelles, characteristics and classification of living things, chromosomes, genes and their relationships and importance, general reproduction, interrelationships of organisms (competitions, parasitism, predation, symbiosis,

commensalisms, mutualism, saprophytism); heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms), elements of ecology and types of habitats.

BIO 107: General Biology Practical I (1 Units C: PH 45)

Learning outcomes

At the end of the lectures, students should be able to:

1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents

Common laboratory hazards: prevention and first aid; measurements in biology; uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy, and proportion; use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101.**

CHM 101: General Chemistry I (3 Units C: LH 45)

Learning Outcomes

At the end of this course, the students will be able to:

1. define atom, molecules and chemical reactions;
2. discuss the Modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionization energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation – reduction equations and solve redox titration problems
6. illustrate shapes of simple molecules and hybridized orbitals;
7. identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure, and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence, forces, structure of solids. Chemical equations and stoichiometry; Chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reactions, equilibrium, and thermodynamics.

Acids, bases, and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II (3 Units C: LH 45)

Learning outcomes

At the end of this course, the students will be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of transition metals.

Course Contents

Historical survey of the development and importance of organic chemistry; Fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning outcomes

At the end of this course, the students should be able to:

1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. tell the differences between primary and secondary standards;
5. perform redox titration;
6. record observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents

Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, the students will be able to:
1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;
5. execute solubility tests on known and unknown organic compounds;
6. execute elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents
Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

MTH 101: Elementary Mathematic I (2 Units C: LH 30)
(Algebra and Trigonometry)

Learning Outcomes
At the end of the course students will be able to:
1. understand basic definition of set, subset, union, intersection, complements and use of Venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. understand various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents
Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity.Circular measure, trigonometric functions of angles of any magnitude, addition, and factor formulae.

MTH 102: Elementary Mathematics II (2 Units C: LH 30)
(Calculus)

Learning Outcomes
At the end of the course students will be able to:
1. understand types of rules in differentiation and integration;
2. understand the meaning of function of a real variable, graphs, limits and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course contents
Function of a real variable, graphs, limits, and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; integration as an inverse of differentiation. Methods of integration, definite integrals. Application to areas and volumes.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes
On completion, the student will be able to:
1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems based on the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents
Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton laws of motion (inertial frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes, and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits

PHY 102: General Physics II (Electricity & Magnetism) (2 Units C: LH 30)

Learning outcomes
On completion, the student will be able to:
1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters and
8. determine the characteristics of ac voltages and currents in resistors, capacitors, and inductors.

Course Contents
Forces in nature; electrostatics, electric charge and its properties, methods of charging, Coulomb's law and superposition, electric field and potential, Gauss's law, capacitance, electric dipoles, energy in electric fields, conductors and insulators, current, voltage and resistance, Ohm's law and analysis of DC circuits. Magnetic fields; Lorentz force, Biot-Savart and Ampère's laws, magnetic dipoles, dielectrics, energy in magnetic fields, electromotive force, electromagnetic induction, self and mutual inductances, Faraday and Lenz's laws. Step up and step-down transformers: Maxwell's equations, electromagnetic oscillations and waves, AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

PHY 107/108: General Physics Practical I & II (2 Units C: PH 90)

Learning Outcomes
On completion, the student will be able to:
1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

Course Contents
This introductory course emphasises quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

200 Level

GST 212. Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes
A student who has successfully gone through this course should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge; and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents
Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of this course, students should be able to:
1. explain the concepts and theories of entrepreneurship, intra-preneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents
Concept of entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate entrepreneurship).Theories, rationale, and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction).Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator, and creative thinker).Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking).Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge, and innovation).Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship).Basic principles of e-commerce.

AGR 201 - Principles of Crop Production (2 Units C: LH 30; PH 45)

Learning Outcomes
Students will be equipped with:
1. basic agronomic terminologies;
2. knowledge of and basis of crop distribution across climatic regions;

3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification; and
5. knowledge of soil management needs and some conservation practices.

Course Contents
Definitions of the terms, crops, and plants (including weeds).Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops.Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.).Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies.

Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance.

AGR 202 Introduction to Agricultural Economics, Extension and Rural Sociology (2 Units C: LH 30)

Learning Outcomes
At the end of the course students will be able to:
1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world-over;
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents
The nature of economics and economic problems. Scope of agricultural economics and methods. The concept of opportunity cost; supply and demand and their application to agricultural problems. Production functions, cost analysis and functions. Concept of elasticities. Type of markets, perfect competition, monopoly, oligopoly etc. Price theory and some applications. The components of agriculture in national income. Aggregate income, expenditure, investment, interest rate, savings, employment. Inflation; international trade, commodity agreements, and balance of payments. Money and banking. The need for agricultural extension in Nigeria and in the world, basic philosophies behind agricultural extension work. The institutional setting of agricultural extension. Basic concepts and principles of rural sociology.

Importance of rural communities and institutions, social stratification, social processes, and social changes in rural areas. Emergence and functions of leadership in rural communities. The extension agent and the rural community. Communication techniques.

AGR 203: Introduction to Forest Resources & Wildlife Management (2 Units C: LH30)

Learning outcomes

The students will be able to:

1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and
5. raise seedlings of economic tree species.

Course Content

Renewable natural resources, availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria. Silviculture, afforestation characteristics of major timbers and their uses. Forest production activities, forest protection and the regulation of harvest for sustained yield. Importance of forest in the national economy. Practical approach to apiculture, snailery, cane rat farming and other forest enterprises.

AGR 204 Introduction to Animal Production (2 Units C: LH 30)

Learning Outcomes

At the end of the course, the students are expected to have known the following:

1. prospects and problems of the animal industry;
2. identification/description of types of farm animals;
3. feeds and feeding management of farm animals;
4. housing and management systems of different livestock;
5. principles of animal health management;
6. animal breeding and breed improvement principles; and
7. basic anatomy and physiology of the living systems (histology, circulatory, respiratory, digestive, reproductive, etc).

Course Contents

The livestock industry – problems and prospects. Description of the breeds of cattle, sheep, goats, pigs, poultry, and rabbits. Systems of livestock production, Feeding and feed management. Principles of breeding and livestock improvement. General principles of management of the different types of farm animals (cattle, sheep, goats, pigs, poultry, and rabbits).Introduction to game and companion animals; general principles of their management, feeding and feeding habits. Endangered livestock species, their management and conservation. Anatomy and physiology of the cell, tissues, nervous system, skeletal system, muscle, bone, circulatory system, reproductive, digestive, special senses, and other systems of farm animals.

AGR 205: Introduction to Fisheries and Aquaculture (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students will be able to:

1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

Course Contents

Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological, economic, and cultural importance of fisheries park, zoo, sport fishing, marine park etc. Scope of fisheries and aquaculture.

AGR 206: Principles of Family and Consumer Sciences, Food Science and Technology (2 Units C: LH 30)

Learning outcomes

At the end of this course students should be able to:

1. state the philosophy and objectives of family and consumer sciences;
2. distinguish between different areas of family and consumer sciences;
3. identify professional opportunities in family and consumer sciences;
4. describe the role of family and consumer sciences professionals in the society;
5. define and explain the scope of Food Science and Technology as a course;
6. describe the methods of distribution and marketing of foods;
7. identify the causes of food poisoning and the ways it could be prevented;
8. state the functions of food, and methods of food processing and preservation; and
9. describe the composition and structures of Nigerian/West African food.

Course Contents
Philosophy, scope, objectives and historical development of family and consumer sciences. Examination of basic human needs with respect to food, clothing, shelter, and health. Different areas of family and consumer sciences. Professional opportunities in family and consumer sciences. The role of a family and consumer sciences professional in today's society. Definition and scope of food science and technology. Food distribution and marketing. Food and its functions. Food habits. Food poisoning and its prevention. Principles of food processing and preservation. Discussion of different preservation methods. Deterioration and spoilage of foods, other post-harvest changes in food. Contamination of foods from natural sources. Composition and structures of Nigerian/West African food; factors contributing to texture, colour, aroma, and flavour of food. Cost; traditional and ethnic influence of food preparation and consumption pattern.

WMA 201: Agro-Meteorology, Biogeography and Climate Change (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, students are expected to know the following:
15. the meanings of climatology, climate change and biogeography;
16. the relationship between climatology, hydrology, and biogeography;
17. basic elements and factors of climate; and climate change variation characteristics
18. relationship between climate and plants, as well as climate and soils;
19. understand basic principles of climate change adaptation and mitigation
20. adaptation in plants and animals.
21. understand biodiversity and ecosystem sustainability, including bio-resource conservation

Course Contents
Basic definitions and explanations in climatology and biogeography. The principles, aims and scope of climatology and biogeography. Climatological problems and investigation methods. Relationships with meteorology, biogeography and hydrology. Biodiversity and ecosystem sustainability. Principles of bio-resource conservation. Climatological data processing methods; basic factors of climate formation, influence of relief on climate and plants. Geographical distribution of climatic elements, plants, and animals. Climate and soil. The concept of adaptation in plants and animals. Classification of climates and biogeography of the earth. The elements and control of climate and weather and the dynamics o the earth's atmosphere. Radiation and heating of the atmospheric systems, atmospheric moisture, and the dynamics of pressure and wind systems. Condensation and precipitation processes. The tropical climate, relation between agriculture and climate with reference to crop, livestock; irrigation, pest and diseases. Climate change and variation characteristics, impacts and adaptations, the importance of common short (e.g. august break, harmattan) and long seasons (dry and rainy seasons) on agriculture.

SOS 207: Principles of Soil Science (2 Units C: LH 30)

Learning Outcomes
At the end of taking the Course, students should be able to know:
1. the role of the soil as a component of the environment;
2. the various disciplines of Soil and Job opportunities as Soil Scientists;

3. how soils are formed and the need to use the soil sustainably;
4. the various physical, chemical and biological activities taking place in the soil in order to prescribe appropriate management needs;
5. the need to survey, classify and map soil for various purposes;
6. the various challenges facing the soil under different situations; and,
7. relationship between climate change, soil management and utilization.

Course Contents

Soil as a natural Resource in the Environment; Sub-disciplines of Soil Science and employment opportunities; Soil Genesis/Formation and Development; Factors of Soil Formation. Soil Composition and Soil Ecosystem Functions; Soil Physical, Chemical and Biological properties (Texture, Structure, Density, Soil Solution, Soil Temperature, Soil Reaction, Salinity, Mineralization, Humification; Ammonification, Nitrification; Soil Organisms and Soil Organic Matter. Introductory Soil Survey, Classification and Mapping. Soil Fertility and Fertility Management; Soil Health. Soil Degradation (weathering, soil erosion, flooding, desertification and contamination); Climate Change and Soil Management.

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to;

1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflicts and violence;
3. differentiate between conflict and terrorism;
4. enumerate security and peace building strategies; and
5. describe roles of international organizations, media and traditional institutions in peace building.

Course Contents

Concepts of peace, conflict, and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes, and rivalries. Economic inequalities, social disputes, nationalist movements, and agitations. Selected conflict case studies – Tiv-Jukun, Zango Kataf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.).Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency, and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national, and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace

keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises;
7. conduct entrepreneurial marketing and e-commerce;
8. apply a wide variety of emerging technological solutions to entrepreneurship and
9. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research).Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods).Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies)

SOS 301: Soil Chemistry and Microbiology (2 Units C: LH 15; PH 45)

Learning outcomes

Students will be able to:

1. have a clear understanding of the sorptive properties of soils, the meaning of soil colloids, mineral colloids, soil reaction, buffering of soils, management of problem soils, soils in the environment, heavy metals and radionuclides, as well as their interactions with crop growth and crop development;

2. have a good knowledge of principles of chemical reactions in the management of fertilizers and other supplementations for optimal agricultural production;
3. describe living soil organisms in action, other living Components of the soil environment- the carbon and nitrogen cycles and the mineral transformations of other elements;
4. describe the mineral transformations of hydrocarbons, the ecological interrelationships and interactions among species in the soil environment;
5. explain the microbiology of the rhizosphere and mycorrhizas, as well as issues of soil health and soil quality (pesticides and herbicides and their decomposition of pesticides; and effect of pesticides, herbicides, foliar sprays and soil conditioners on soil organisms and
6. know the effects of our general agricultural practices on soil organisms and their activities
7. appreciate the advanced methods of studying microbial ecology; antibiotic resistance; and selectable markers, serology, gene typing and other methods of molecular biology.

Course Contents

Soil colloids; general constitution of silicate clays, sorptive properties of soils (electrically charged surfaces, exchangeable cations and cation exchange capacity; the diffusive layer, characteristics of cation exchange, selectivity of cation adsorption, anion retention, adsorption of organic molecules, sorption of gases. mineral colloids. Soil Reaction: acidity and alkalinity. Acidification of ecosystems. Buffering of soils. Management of problem soils: saline and sodic soils. Soils and chemical pollutants (pesticides, nitrates and eutrophication of surface waterways. Heavy metals and radionuclides. Radionuclides in soils. The general soil environment, organisms in action (organism numbers, biomass, and metabolic activities, soil micro-animals, roots of higher plants. The living components (bacteria, actinomycetes, fungi, algae, protozoa, viruses). The carbon cycle, The nitrogen cycle. The mineral transformations (phosphorous, sulphur, iron, manganese, and other elements).The mineral transformations of hydrocarbons. decomposition of plant and animal residues in soils; ecological interrelationships (interactions among species in the soil environment, microbiology of the rhizosphere. Mycorrhizas, pesticides and herbicides and their decomposition of pesticides. Effect of pesticides, herbicides, foliar sprays, and soil conditioners on soil organisms. Herbicides and their decomposition. Effects of agricultural practices on soil organisms and their activities. Activities of soil organisms beneficial to higher plants. Advanced methods of studying microbial ecology:; antibiotic resistance and selectable markers, serology, gene typing and other methods of molecular biology.

SOS 302: Introduction to Agricultural Mechanization (2 Units C: LH 15; PH 45)

Learning Outcomes

Students will be able to:

1. explain the goals and principles of agricultural mechanization. Basic mechanics: force, distance, time, velocity scalar and vector quantities, etc. Principles of two and four stroke engines; internal combustion engines, electric motors. Farm power transmission lines;
2. define and demonstrate importance of mechanization of agricultural practices: from the field to the table. On-site experience of land preparation operations and equipment used;
3. Perform land clearing (felling and stumping), and ploughing, tillage operations (ridging and harrowing); planting/sowing operations, herbicides/pesticides and fertilizer distribution operations;
4. handle some harvesting, handling and transport operations; agricultural produce processing and storage operations and preservation, including safety in use of preservatives and

5. handle some livestock machines and equipment, automated food conveyors, milking watering and meat processing and canning. Planned visits to mechanized agricultural farms.

Course Contents
Goals and principles of agricultural mechanization. Basic mechanics: force, distance, time, velocity scalar and vector quantities, etc. Principles of two and four stroke engines; internal combustion engines, electric motors. Farm power transmission lines. Importance of mechanization of agricultural practices: from the field to the table. On-site experience of land preparation operations and equipment used. Land clearing (felling and stumping), and ploughing, tillage operations (ridging and harrowing); planting/sowing operations, herbicides/pesticides, and fertilizer distribution operations. Harvesting, handling and transport operations; agricultural produce processing and storage operations and preservation, including safety in use of preservatives. Livestock machines and equipment, automated food conveyors, milking watering and meat processing and canning. Harvesting, handling and transport operations; agricultural produce processing and storage operations and preservation, including safety in use of preservatives.

SOS 303: Pedology and Soil Physics (2 Units C: LH 15; PH 45)

Learning Outcomes
Students will be able to:
1. decipher the differences and distinguish between soil and land, between land and landscape;
2. determine how soils are formed, factors and processes involved in soil formation and soil differentiation, the myriad of processes operating within the soil medium concurrently and simultaneously;
3. explain the concept of the soil system as a natural body, as a disperse system and as an open system;
4. describe the peds as the smallest units of the soil structure, levels of structural organization, Soil micro-morphology, and the creation of soil structure and pore volume.
5. discuss the origin of the soils on which all plants/crops are grown, and as the bedrock of agriculture and by direct implication food security;
6. characterize their soils and employ their knowledge of the soil characteristics and manage all types of soils, including problem soils for food production food security;
7. explain the meaning, scope, soil constituents, and their relations with the broad area of soil science, as well as with crop growth and crop development; and
8. explain soil mechanics, heat, light, energy and other classical physics concepts to the soil-plant-atmosphere continuum; the mechanical behaviour (rheological behaviour of the soil mass and the effects of soil physical conditions on plant growth, as well as the management of soil physical conditions for optimal agricultural production.

Course Contents
Introductory: Soil, land and landscape. Processes in the soil environment. Jenny's factors of soil formation: The parent material. Climate, organisms, relief, and time. Soils as the bedrock of agriculture. Soils as non-renewable natural resource. Soils as a disperse system. Peds and pores, levels of structural organization, Soil micro-morphology, the creation of soil structure, pore volume. Approaches to the concept and study of soils: pedological or edaphological? Weathering of rocks and minerals: types of weathering, types of parent materials. Soil profile

development: processes and factors of profile development; nomenclature and identification of soil horizons: master and sub-horizons and layers, transitional and combination horizons, suffix symbols, soil catena concept. Reactions and processes of soil genesis: weathering and end-products of inorganic and organic fractions; Inorganic components of soils; rocks and minerals, primary minerals, secondary minerals, clay minerals (1:1 and 2:1). eluviation and illuviation of bases, silica, aluminum, iron, clay, and organic matter; development of pans, nodules, and concretions; progressive soil development; soil orders and the genesis of their diagnostic horizons. Concepts and basic definitions of soil physics. Soil physics as a complementary branch of soil science. Physical & rheological properties of the soil. Mechanical composition of Soils: soil structure, soil texture, dynamic properties of soils. Soil air and aeration, soil thermal properties, soil water content I (tension etc), Soil water II (energy state forces acting on soil water), Soil water III (flow of water in soil, Darcy's law, Stoke's law, hydraulic conductivity, etc), Soil water IV (water infiltration into soils and soil water re-distribution, infiltration equations). Soil physics applications (Soil water for plants and management of soil physical conditions). Appreciation of soil physical fertility as just important as chemical and biological fertility.

SOS 304: Soil Water Conservation and Management (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the course, students will be able to:

1. know the structure of water and related properties of water. Water retention forces. Soil water energy concepts;
2. describe soil water classification for water management and soil water retention;
3. Measure soil water content and other parameters;
4. Estimate of water contents, water flow through soils, water uptake by plants, consumptive use of water. Water-use efficiency. Reducing water losses and
5. describe all water harvesting techniques, water balances and their models' equations/applications.

Course Contents

Introductory definitions and descriptions. Structure of water and related properties of water. Water retention forces. Soil water energy concepts. Soil water classification for water management. Soil water retention. Measurement of soil water content and other parameters. Estimation of water contents, Water flow through soils. Water uptake by plants, consumptive use of water, water-use efficiency. Reducing water losses. Water conservation and management (water harvesting techniques: rainwater harvesting, dams, pond, wells, etc). Climatic water balances and estimation models.

SOS 305: Basic Statistics and Experimental Designs for Agriculture (2 Units C: LH 30)

Learning Outcomes

At the end of the course students will be able to:

1. explain basic concepts of statistics;
2. estimate the measures of location, partition and dispersion;
3. develop research designs for simple agricultural experiments;
4. collect data, perform and interpret inferential statistics;

5. create research instruments and analyze data emanating from it; and
6. use simple statistical softwares to perform data analysis and interpret same.

Course Contents

Basic concepts of statistics, descriptive statistics, measures of central tendency, measures of dispersion, summary statistics. Data collection and processing techniques; statistical inference; Test of significance; F-test, T-test, Chi-Square; Experimental procedures – cause and control of experimental error; Analysis of variance – one way and multiple ways classification; Analysis of co-variance, Regression and correlation analysis; Determination of goodness of fit; research objectives, Research designs – CRD, RCBD, split-plot designs and factorial experiments; Surveys and Questionnaires designs and administration; Mensuration; Field experimentation; Analysis and processing and data (manually and digitally); Mean separation, Statistical interpretation of results.

SOS 306: Introduction to Application of Computer in Soil Science (2 Units C: LH 15; PH 45)

Learning Outcomes

After taking the Course, the Students should be conversant with:

1. appropriate terminologies and proficiency necessary for Microsoft Word, Excel Spreadsheets and PowerPoint;
2. how to effectively use the Computers to process information, organize and analyze data using different statistical packages;
3. prepare documents for presentations
4. how to apply the computer in the various soil services (soil testing, surveys, mapping, etc.); and,
5. the use of Computers in surfing the internet for various information, communication and technology (ICT).

Course Contents

Computers and applications in the modern world; Information, Communication and Technology (ICT) revolution and applications in Soil Science, Agriculture and Environment. Basic Computing: Microsoft Word Processing and Applications, Spreadsheets, Power Point Presentations. Data presentations and Management; Computers in Soil Analysis; Computers in Pedometrics, Soil Surveys, Soil Mapping; Computers in Modeling Soil Information and Ecosystem Systems. Computers and the Internet Services-Geographic Information Systems, Google Earth, etc.

SOS 307: Soil Fertility Management and Plant Nutrition (2 Units C: LH 15, PH 45)

Learning Outcomes

At the end of the course, students will be able to:

1. define and describe the basic concepts; that even a highly fertile soil gets exhausted of its reserves nutrients as crops are grown and harvested continuously and needs replenishment. Linking of knowledge of soil fertility and soil fertility management to soil productivity, and

ultimately to agricultural input and output Management, presents the key to sustainable agriculture and food security worldwide;
2. describe the natural resource endowment of soils in soil organic matter, which at the primary levels of training are referred to as humus; appreciate the role of soil organisms in the processes of organic matter formation and the changes in plant and animal remains due to activities of soil organisms; properties of soil organic matter and factors affecting the rate of organic matter decomposition;
3. describe organic matter of mineral soils and organic manures, The carbon cycle. The C/N ratio; compost and composting and other forms of organic source. Nutrients for plant growth. The pathway of nitrogen, phosphorus and sulphur, potassium, calcium and magnesium. Trace elements;
4. explain the prime importance of soil fertility restoration, improvement, and maintenance of the productive capacity of the soils, but also for a priori diagnosing soil clinical needs for overall productivity capacity of soil-plant relationship;
5. demonstrate the application of integrated soil fertility management to overcome problems of mismanagement of fertilizers (excessive application, inappropriate mixes of organic and inorganic fertilizer elements etc.);
6. discuss the plant-soil interface, as supplemental to their knowledge of soil fertility and soil management course and for their anticipated roles as crop-farm managers of the future; and
7. describe plant mineral nutrition aspects of plant physiology and the diagnostic techniques for plant nutrition which enables these graduates to advise farm owners at all levels, especially for early detection of mineral nutrient element deficiencies and indeed early incidences of toxicities and excessive accumulation.

Course Contents

Concepts in soil fertility. Soil fertility versus soil productivity. Soil productivity and fertilizer use. Fertility of tropical soils and its management. Origin of soil organic matter. The soil organisms. Changes in plant and animal remains due to activities of soil organisms. Properties of soil organic matter. Factors affecting the rate of organic matter decomposition. Organic matter of mineral soils and organic manures. The carbon cycle. The C/N ratio; compost and composting and other forms of organic source. Nutrients for plant growth, The pathways of nitrogen, phosphorus and sulphur, potassium, calcium and magnesium. Trace elements. Wetland soil fertility and its management. Lime, liming materials and soil fertility management. Practical management of soil nitrogen, sulphur and soil fertility maintenance. Supply and availability of phosphorus and potassium. Micronutrient elements, Micronutrient needs and fertility management. Crop growth response to soil nutrients. Fate of nutrient elements in the soil (crop removal, leaching, erosion, volatilization, denitrification and fixation).Sustaining soil fertility. Principles of mineral nutrition of plants. Plant growth and root development in soils (photosynthesis and nutrient uptake by roots, water use and efficiency). Chlorophyll formation and chlorosis. Range of inorganic mineral elements in plants. Essential and non-essential elements (major, secondary and trace elements) in crop nutrition. Importance of select-nutrients in plants. Root development and mode of action of the mineral nutrients (nutrient absorption, nutrient balance, maintenance, and loss of nutrients in soil fertility. Soil factors influencing nutrient availability. Plant nutrient status and diagnostic techniques for plant nutrition (visual symptoms of deficiencies, chemical analysis of plant parts or saps, plant tissue tests, measured plant response to added nutrients). Mineral nutrients deficiencies versus toxicities.

400 Level

SOS 401: Soil Survey, Classification and Land-Use Planning (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students would have:

1. known, learnt, and understood both the definitions of land and the soil within; the differences between land and soil, as well as the fact that land and soil are mankind's number one natural resource base or heritage; and,
2. learnt and understood the need to improve capacity of practitioners to manage finite resources and increased agricultural productivity requires adequate land resources information, and best practices and approaches for best practices.

Course Contents

Basic concepts, definitions, aims and roles of land evaluation.Methods and procedures in land evaluation.Land selection and classification. Land use planning (kinds, uses, procedures, interpretations). Improvements in land use planning and practices (promising methods and tools etc). Sustainable land use management (need for sustainable land management, information communication and technology and SLM, future perspectives etc).Introduction to Geographic Information Systems and use of GIS for interpretations.

SOS 403 Soil Irrigation and Soil Drainage (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students would have:

1. known, learnt, and understood both the definitions of Soil irrigation and soil Drainage;
2. known the different types of irrigation and drainage of agricultural Lands;
3. learnt the differences between arid lands and soils and semi-arid lands and soils; and
4. learnt and understood the need to improve capacity of practitioners to manage finite resources and increased agricultural productivity requires adequate land resources information, and best practices and approaches for best practices.

Course Contents

Basic definitions of irrigation and irrigation terminologies. Basic principles of irrigation. Reasons for irrigating agricultural soils. Irrigation worldwide and in Africa. Basic soil-water-plant relations; water needs of plants. Irrigation water sources & quality of water for irrigation; irrigation water scheduling evapotranspiration measurement and predictions using different models. Types of irrigation systems; components, advantages, and disadvantages of various irrigation types. Special irrigation techniques. Methods of irrigation water application. Delivery and application of irrigation systems. Systems uniformities and irrigation efficiencies. Water harvesting & storage for irrigation. Fertigation and its application in tropical soils. Basic definitions of drainage systems. Soils that need drainage. Importance of draining waterlogged/submerged soils. Problems of draining waterlogged/submerged soils. Selecting drainage systems. Surface drainage systems. Subsurface drainage systems. Drainage

coefficients and porosity; problems of subsurface drainage. Darcy's equation, rational formula for drainage design.

SOS 404: Soil Physics and Hydrology (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the course, students will be able to:

1. discuss lucidly the concept of soil as a system: (Soil phases and dimensions), as an open system of inputs and outputs. and as a disperse system;
2. explain in greater details: soil water potentials, characteristic, soil water balance, infiltration, saturated and unsaturated flows, continuity equation, Darcy Richards's equation. Soil temperature and heat movement;
3. describe Climatic factors affecting plant growth. Solar Radiation, energy balance. Soil structure, aggregate stability, factors affecting soil structure. Soil aeration. Tillage: conventional and conservation tillage; physics of rainfall; amount, intensity, kinetic energy, momentum; Soil erosion and conservation mechanisms of water & wind erosion, types, and factors of soil erosion;
4. define and describe better Models of water, energy, and heat transport in soil. Soil erosion & hydrology models & modelling. Field demonstration of some models such as the Universal Soil Loss Equation (USLE), RUSLE, WEPP, SPAW, LEACHIM, Methods of erosion control will be undertaken.
5. state the introductory definitions and descriptions, as well as water resources of the earth. The free energy of the soil water. and its importance to agriculture and mankind. Infiltration (The Darcy's law, stages of infiltration, The hydraulic conductivity. Redistribution of soil water (The wetting front, field capacity, unsaturated flow, non-steady state conditions, solute transport). The moisture characteristic curve. Hysteresis. Evaporation and evapo-transpiration. Waters Resources and Irrigation of agricultural lands and
6. clearly appreciate the availability of water at the global level in different forms, but also the circulation of water, as shown in the hydrologic cycle at the global scale. (The global picture, water balance on a local scale. The water balance equations and different models).

Course Contents

Basic soil physical properties, their relevance and determination. The soil as a system: soil phases and dimensions. Soil water potentials, characteristic, soil water balance, infiltration, saturated and unsaturated flows, continuity equation, Darcy Richards's equation. Soil temperature and heat movement; Climatic factors affecting plant growth. Solar radiation, energy balance. Soil structure, aggregate stability, factors affecting soil structure. Soil aeration. Tillage: conventional and conservation tillage; physics of rainfall; amount, intensity, kinetic energy, momentum; Soil erosion and conservation mechanisms of water & wind erosion, types, and factors of soil erosion. Models of water, energy, and heat transport in soil. Soil erosion & hydrology models & modelling. Demonstration of some models such as, the Universal Soil Loss Equation (USLE), RUSLE, WEPP, SPAW, LEACHIM. Methods of erosion control. Introductory definitions and descriptions. Water resources of the earth. The free energy of the soil water. and its importance to agriculture and mankind. Water resources of the earth. Infiltration (The Darcy's law, stages of infiltration, The hydraulic conductivity. Redistribution of soil water (The wetting front, field capacity, unsaturated flow, non-steady state conditions, solute transport). The moisture characteristic curve. Hysteresis. Evaporation and evapo-transpiration. Waters resources and irrigation of agricultural lands. The hydrologic cycle at the global scale.(The

global picture, water balance on a local scale. The water balance equations and different Models).

SOS 405: Fertilizers, Fertilizer Manufacture and Fertilizer Use (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of teaching of this course, the students would be able to:

1. explain that the world's best immediate hope for rapid increases in food, feed, fiber and even wildlife resources is the application and wise use of fertilizers, which can increase yields worldwide by at least 50%;
2. identify "alternatives and options" to the use of fertilizers (animal manures, sewage sludge, composts, etc); and
3. discuss the 4R Nutrient Stewardship, namely, Right source, Right rate, Right time, and Right place does it!

Course Contents

Fertilizers: Definitions of fertilizers; Purpose of fertilizer use. Fertilizer use: The situation in Nigeria (history and justification, economics of fertilizer use, and efficient use of fertilizers). Fertilizer elements (nitrogen as the keystone of protein; sulphur as essential for protein; phosphorus as key to life; and potassium as the catalyst; and micronutrient fertilizers for healthy plant growth). Use of individual mineral fertilizers, types of mineral fertilizers, use of organic fertilizers, types of organic manures, organic matter, organic manures of plant and animal origin, organic manures of natural solid minerals origin). Multi-nutrient fertilizers. Fertilizer manufacture, sources, handling, and storage of fertilizers. Fertilizer applications (right source, right method, right rate, right time and right place).Fertilizers, farming, and the environment: issues of sustainability of use and of environment integrity.

SOS 406: Soil Chemistry and Mineralogy (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the course, students will be able to:

1. describe basic concepts: Law of mass action and equilibrium constant – solubility products, dissolution of strong and weak electrolytes, equilibrium constant and ion exchange phenomena in soils;
2. describe equilibrium and constant free energy relationships. Solid phase: origin and distribution of charges on soil colloidal surfaces, point of zero charge, electrical charges of soil/water interfaces, double layer theory; mechanisms of cation and anion fixation in soils. Liquid phase: composition, concentration, activities, and activity coefficients. Soil acidity;
3. state clearly the meaning of silicate clays, clay types and chemical composition of silicate clays; and
4. discuss the influence of mineral and organic colloids in the soil-plant-atmosphere continuum; as well as in the management of other soil properties like plasticity, cohesion, swelling, shrinkage, dispersion, and flocculation for optimal agricultural production.

Course Contents

Basic concepts: Law of mass action and equilibrium constant – solubility products, dissolution of strong and weak electrolytes, equilibrium constant and ion exchange phenomena in soils.

Equilibrium and constant free energy relationships. Solid phase: origin and distribution of charges on soil colloidal surfaces, point of zero charge, electrical charges of soil/water interfaces, double layer theory; mechanisms of cation and anion fixation in soils. Liquid phase: composition, concentration, activities, and activity coefficients. Soil acidity. Genesis of silicate clays; geographic distribution of clays worldwide. Mineral colloids other than silicates, organic soil colloids, colloids (acid salts). Chemical composition of silicate clays; clay types: phyllosilicates, allophones, imogolites: mineral separation and identification. Crystal chemistry and mineral structures; 1:1, 2:1, and 2:2 clays types of and properties of bonding; structural classification of soil minerals; minerals in soil environment. Other properties of colloids – plasticity, cohesion, swelling, shrinkage, dispersion, and flocculation. Fractionation and analytical methods; applications of clay minerals in industry, agriculture, and environmental management.

SOS 407: Soil Testing and Plant Tissue Analysis (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the course, students will be able to:

1. explain the importance of soil fertility evaluation; basic concepts in soil fertility studies (law of minimum, law of diminishing return, The Baule percentage yield, and Bray's nutrient mobility);
2. demonstrate soil fertility evaluation techniques: biological methods (crop/fertilizer (measured crop responses) experimentations, Neubauer seedling method, *Aspergillus niger* method, soil plaque method); visual observation of growth characteristics and leaf-colour changes, soil testing and soil chemical analysis; and
3. define and describe plant tissue mineral element (or nutrient) analysis. Of particular importance would be their understanding of data interpretation (interpretation of soil test values, soil test calibration, critical soil test level approaches. Soil test reporting, soil test summaries, nutrient index and soil fertility maps***.***

Course Contents

Importance of soil fertility evaluation; basic concepts in soil fertility studies (law of minimum, law of diminishing return, The Baule percentage yield, and Bray's nutrient mobility). Soil fertility evaluation techniques: biological methods (crop/fertilizer (measured crop responses) experimentations, Neubauer Seedling method, *Aspergillusniger* method, soil plaque method); visual observation of growth characteristics and leaf-colour changes, soil testing and soil chemical analysis, plant tissue mineral element (or nutrient) analysis. Data interpretation (interpretation of soil test values, soil test calibration, critical soil test level approach. Soil test reporting, soil test summaries, nutrient index and soil fertility maps.

SOS 408: Research Methods and Scientific Writing (1 Units C: LH 15)

Learning Outcomes

At the end of the course, students will be able to:

1. intuitively ask questions and think inquisitively;
2. develop writing skills; and
3. write scientific reports

Course Contents
Principles of scientific experimentation; major experimental designs; and treatment arrangements. Sampling methods: grid system, systematic sampling, random sampling cluster sampling, judgment sampling. sampling procedures and their criteria. Data information gathering; quantitative and qualitative methods of data collection and data analysis.Methods of extrapolation of remote data; data transformation. Elements of scientific writing: Principles of effective communication and technical report writings. Preparation of manuscripts for oral presentations, poster presentations and for publications.

SOS 409: Soil Biology and Biochemistry (2 Units C: LH 15; PH 45)

Learning Outcomes
Students will be able to:
1. determine the presence of both living and non-living things/organisms in the soil;
2. distinguish the differences between macro-biology/Soil fauna and micro-biology; biological nitrogen fixation, and chemical transformations involving microorganisms in the soil, oxidation and reduction reactions. Methods of studying soil microbial population, and factors influencing microbial growth; The rhizosphere, mycorrhizas;
3. decipher the nature, activities, and usefulness of soil microorganisms (bacteria, actinomycetes, fungi, algae, protozoa, viruses, etc.) to agriculture and by direct implications humanity;
4. analyze the phenomena in the carbon cycle, the nitrogen cycle, biological nitrogen fixation, ammonification and nitrification, denitrification, oxidation and reduction;
5. Demonstrate the methods of study of the soil microbial population. Factors influencing microbial growth, Microbial nutrition, autotrophy and heterotrophy;
6. state basic definitions, comparisons and contrasts in the study of soil biology (Macro) and soil microbiology (Flora), and the productivity of our soils depended virtually upon the activities of both macro- and micro-organisms in the soil and their transformations of nitrogen, carbon, phosphorus, sulphur, iron, and other elements such as manganese; and
7. define and describe biodegradation of both solid and liquid contaminants in the soil, particularly pesticides, herbicides, basics in soil contamination, soil pollution, possible sources of soil pollution: point and non-point soil pollution, aspects of bio-augmentation, and bio-accumulation, as consequences of soil micro-biochemical reactions will be taught.

Course Contents
Basic definitions, grouping of organisms (soil animals or soil fauna, macroorganisms and microorganisms) present in the soils. Soil fauna (earthworms, termites, rodents, rats, human, millipedes, centipedes, mites, and springtails ants, etc.).Inter-relationships between soil organisms, symbiosis, proto-cooperation, commensalisms, amensalism, predation, parasitism and competition. The rhizosphere. Mycorrhizas. Mineral transformations: microbial transformations of phosphorus, sulphur, iron, and other elements such as manganese biodegradation of both solid and liquid contaminants in the soil. Pesticides in the soil, herbicides in the soil. Basics in soil contamination, Soil pollution, possible sources of soil pollution: point and non-point soil pollution. bio-augmentation, and bioaccumulation, as consequences of soil biochemical reactions. The carbon cycle. The nitrogen cycle. Biological nitrogen fixation, ammonification and nitrification, denitrification, oxidation and reduction. Methods of study the soil microbial population. Factors influencing microbial growth, microbial nutrition, autotrophy

and heterotrophy, basic definitions. Comparisons and contrasts in the study of soil biology (macro) and soil micriobiology (Flora). Pathways of nitrogen cycle, and the carbon cycle.

SOS 498: Final Year Seminar Report (1 Units C: LH 15)

Learning Outcomes

At the end of the second semester in final year of study, our students should be able to:

3. write organized essays, scientific writing following acceptable logical sequences;
4. review existing body of knowledge and current literature, sifting relevant results/findings from such articles from irrelevant parts, appreciating limitations and gaps inherent in such articles and using such information in formulating, and developing both null and alternative hypothesis for future works.

Course Contents

A comprehensive report on a topic in soil science or any other course with the agriculture programme. The seminar topic shall be presented in any structure or format suitable for the detailed discourse of the topic under the supervision of a lecturer assigned to do that, as routine academic work.

SOS 499 Final Year Research Project (4 Units C: PH 180)

Learning outcomes

At the end of the course, students will be able to:

1. develop an inquisitive mind, an analytical mind, a problem-solving and due-diligence disposition in the solving problems militating against agricultural soils' productivity and agricultural development in the country;
2. develop high reasoning capacity into agronomic problems of economic importance to the society is developed in the students as he/she introduces his/her identified constraints; ability to acknowledge past research efforts and past results and findings and unresolved issues are recorded in the literature reviews section;
3. acquire the capacity to assemble appropriate tools/instruments, following appropriate procedures/ways and means, as well as the materials needed to carry out reproducible and verifiable data are detailed in the Materials and Methods section;
4. present the results and discussion section, and learn how to organize experimental data, learn the science of logic in the use of statistics, statistical deductions and inferences, as well as significance levels, learn rationale thinking and reasoning in interpretation of data and comparative analysis; and
5. learn how to confirm/accept and/or refuse/reject original hypothesis (null and alternative) in their concluding sections.

Course Contents

This is the conduct of practical investigation and/or an assessment/evaluation into an identified agronomic (soil, soil-crop, and/or soil-crop-climate) constraints to improved soil fertility and productivity and/or increased yields of specified crop of local/international importance. This investigation, referred to as research project should be carried out by the student following generally acceptable steps/milestones in any systematic inquiry, under the supervision of select-senior members(s) and faculties. At the end of the investigation, the student will be required to present a project thesis/dissertation that will be defended before an invited external examiner

in partial fulfilment of the requirements of the award of Bachelor of Science (Soil Science) or Bachelor of Agriculture (Hons) degree in Soil Science.

Minimum Academic Standards

To achieve the benchmark statements for any programme, there should be

1. a minimum number of identifiable laboratories for each programme which should be in accordance with the NUC recommended space requirements and, in addition, be reasonably equipped.
2. at least one large and reasonably equipped central laboratory for major teaching and research equipment.
3. It is important that equipment should be acquired in sufficient number to enable adequate implementation of the benchmark statements as they relate to mathematics, science, design, information and communications technology, business and professional practice.

Equipment for Bachelor of Soil Science training

1	pH meter (Table Top)
2	pH Meter (Portable)
3	Conductivity Meters
4	Analytical Balances
5	Weighing Balances
6	Top Loading Balance
7	Soxhlet Extractor
8	Atomic Absorption Spectrophotometer ASS
9	UV-VIS Spectrophotometers
10	Visible Light Spectrophotometer
11	Flame Analyser/Photometer
12	Rotary Evaporator
13	Gas Liquid Chromatograph
14	Multiple Element Analysis
15	Fume Chamber/Cupboard
16	Colorimeters
17	Viscometer
18	General Purpose Centrifuge
19	Colony counter
20	Desiccators
21	Kjeldahl Apparatus complete with Digesting unit
22	Micro-Kjeldahl Apparatus
23	Furnace
24	Orbital Shaker
25	Reciprocal Shaker
26	Multi-cuvette Autoclave
27	Water Deionizer
28	Automatic burrette
29	Automatic pipettes
30	Water bath

31	Hot Plates
32	Sieve Shaker and Graded Sieves
33	Geographic Information System units (GPS)
34	Water distillers
35	Magnet stirrers
36	Hydrometers
37	Digital Multi-Mixers
38	Soil Augers
39	Colour Charts
40	Double Ring Infiltrometer
41	Soil Thermometers
42	Soil Water Probe
43	Forced Draught Ovens
44	Incubator Ovens
45	Deep Freezers
46	Abney Level
47	Ranging Poles
48	Survey equipment

Staffing

Academic staff

The NUC guidelines on staff/student ratio of 1:15 for for the agriculture discipline applies to the Soil Science programme. Also, there should be a minimum of six full-time equivalent of staff in the department. There is need to have a reasonable number of staff with doctoral degrees as well as sufficient industrial/practical experience. With a minimum load of 18 Units per semester for students and a minimum of six full-time equivalent of staff in each sub-discipline or specialization areas. Staff should have a maximum of 15 contact hours per week for lectures, tutorials, practical and supervision of projects.

For the programme, the academic staff number should be as *per* the National Universities Commission (NUC) guidelines. The academic staff pyramid should be composed as follows-

1. Professor/Reader - 20%
2. Senior Lecturer - 35%
3. Lecturer 1 and Below - 45%

Technical support personnel

The services of technical support staff, which are indispensable in the proper running of laboratories and workshop/studios are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance. The minimum of academic staff to technical staff ratio of 5:1 should be maintained.

Library

There must be adequate library facilities to cater for the needs of staff and students in all the programmes in the college/faculty. These include current journals, handbooks, textbooks,

manuals, codes of practice, standards, and specifications etc. in sufficient numbers. Most importantly, there shall be provision for ICT-based access to electronic resources and the information super highway.

Classrooms, Laboratories, Clinics, Workshops and Offices Spaces

The NUC recommends the following physical space requirements

		m^2
Professor's office	-	18.50
Head of Department's office	-	18.50
Tutorial teaching staff's office	-	13.50
Other teaching staff space	-	7.00
Technical staff space	-	7.00
Secretarial staff space	-	7.00
Academic staff research laboratory	-	16.50
Seminar space/per student	-	1.85
Laboratory space	-	7.50

B.Sc. Water Resources Management and Agro-Meteorology

Overview

The B. Water Resources Management and Agro-meteorology is one of the programmes in the agricultural science discipline. It is designed to provide a broad based theoretical and practical knowledge aimed at enabling graduates to be self-reliant and self-employable, on completion. It is also to train high level manpower that can easily fit into the technical and administrative positions, at both national and international organizations and institutions. The course is designed to have duration of four years, and consists of two areas of specialization, namely Water Resources Management and Hydrology, and Agro-meteorology. In the first two years, students are expected to take the same courses. The specialization is however, expected to be effective at the third and final years of study.

Philosophy

The overall philosophy of the agricultural programmes in the Nigerian universities is to produce graduates that will help in achieving the goals and objectives of the national policy on agriculture, and meet the requirements for food security, and general self-reliance. Graduates will therefore be trained to be adequately equipped with comprehensive theoretical knowledge and practical skills required for meaningful engagement in agriculture and agriculture related fields, thus making them self-reliant and valuable to the industry and society in general. The water resources and agro-meteorology programme is therefore aimed at producing graduates that will be well trained and equipped in the management of water resources and agricultural related meteorology.

Objectives

The objectives of the programme are to:

1. train students that can apply the knowledge of water resources to tackle national food production challenges.
2. provide appropriate knowledge and skills needed for the intellectual development for research in agricultural related jobs.
3. train students that will be knowledgeable and contribute in formulating and strengthening of national agricultural policies and research.
4. enable students acquire quantitative and analytical skills as well as adequate knowledge in the use of computer software packages in analysing and solving problems within the global agricultural and water resources management systems.
5. produce graduates with sufficient skills to pursue further studies in water resources management and agro-meteorology, as well as other related fields.
6. produce high level manpower that can serve as career officers and provide managerial and advisory services in national and international organisations.

Employability skills

Graduates shall be trained to be sufficiently employable in several areas, including the following

1. Water resources management
2. Management of extreme conditions of water availability
3. Weather forecasting and prediction
4. Water pollution abatement and control
5. Water quality assessment
6. Techniques in irrigation

21st century skills

The programme will lead to the acquisition of the following 21st century skills

1. Critical thinking,
2. Creativity
3. Collaboration
4. Communication
5. Information literacy
6. Media literacy
7. Technology literacy
8. Flexibility
9. Leadership
10. Initiative
11. Productivity
12. Social skills

Unique features of the programme

The programme's uniqueness is its focus on the judicious utilisation of water and its resources in enhancing food and animal production, as well as stimulating overall human and socio-economic development. The application of the knowledge of the relationship between climate and agriculture in plant and animal production is equally unique. This curriculum is generally geared towards enabling graduates to be self-reliant, self-employable and well equipped with current communication, leadership, and practical skills.

Admission and graduation requirements

Admission requirements

UTME- Four Year Degree Programme

Candidates seeking admission into the four-year programme in Water Resource Management and Agro-Meteorology should possess Senior Secondary Certificate (SSC) with credit passes in the following five subjects: English Language, Mathematics, Chemistry, Physics or Geography, Biology or Agricultural Science, at not more than two sittings. In addition, applicants must obtain an acceptable pass in the Unified Tertiary Matriculation Examination (UTME).

Direct entry

Candidates must have at least 2 credit passes in Advance level in Chemistry, Biology or Agricultural Science and Physics or Geography in addition to UTME entry requirements. Holders of ND and HND in Water Resources Management and related field with a minimum of Lower Credit are eligible for consideration for admission into 200 level.

Graduation requirements

Students admitted must register and pass a minimum of 120 credit units for a 4-year duration (for those admitted through UTME mode) **and 90 credit units (for those admitted through direct entry) for a four -year duration.**

Global course structure

100 Level

Course Code	Course title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
AGG 102	Introduction to Agriculture I	2	C	30	-
AGG 112	Introduction to Agriculture II	1	C	15	-
BIO 101	General Biology I	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
CHM 107	General Chemistry Practical I	1	C	-	45
CHM108	General Chemistry Practical II	1	C	-	45
MTH 101	Elementary Mathematics 1	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 107	General Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
Total		**26**			

200 Level

Course code	Course title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	15	45
AGR 201	Principles of Crop Production	2	C	45	-
AGR 202	Introduction to Agricultural Economics, Extension and Rural Sociology	2	C	45	-
AGR 203	Introduction to Computer Applications to Water Resources Management and Agro-Meteorology	2	C	45	-
AGR 205	Introduction to Fisheries and Aquaculture	2	C	30	-
WMA 201	Agro-Meteorology, Biogeography and Climate Change	2	C	30	-
WMA 202	Elements of Geo-sciences	2	C	30	-
WMA 203	Principles of Weather Forecasting	2	C	30	-
	Total units	**18**			

300Level (Water Resources and Hydrology option)

Course code	Course title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
WMA 301	Surface Hydrology	2	C	30	-
WMA 302	Groundwater Hydrology	2	C	30	-
WMA 303	Hydro-Met Instrumentation and Network Design	2	C	30	-
WMA 304	Tropical Weather Systems, Analysis and Predictions	2	C	30	45
WMA 305	Principles of Dam Development and Management	2	C	30	-
WMA 306	Agricultural Irrigation and Drainage	2	C	30	-
WMA 307	Practical Year Experience Report	1	C	-	270
	Total units	**17**			

300 Level (Agricultural Meteorology Option)

Course code	Course Title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
WMA 304	Tropical Weather Systems, Analysis and Prediction	2	C	30	-
WMA 306	Agricultural Irrigation and Drainage	2	C	30	-
WMA 308	Agro-Meteorology	2	C	30	45
WMA 309	Agro-Meteorology and Ecology	2	C	30	-
WMA 310	Hydro-Met Instrumentation and Network Design	2	C	30	-
WMA 311	Weather Forecasting for Agricultural Management	2	C	15	45
WMA 307	Practical Year Experience Report	1	C	-	270
	Total units	**17**			

400 Level (Water Resources and Hydrology Option)

Course code	Course title	Units	Status	LH	PH
EMT 401	Environmental Law	2	C	30	-
EMT 404	Waste Water Management	2	C	30	-
WMA 401	Hydro-Meteorological Forecasting	3	C	13	90
WMA 402	Water Resources Planning and Management	3	C	45	-
WMA 403	Watershed Management	2	C	15	45
WMA 404	Water Resources and Public Health	3	C	45	-
WMA 499	Project	6	C	**-**	270
	Total units	**21**			

400 Level (Agricultural Meteorology Option)

Course code	Course Title	Units	Status	LH	PH
EMT 401	Environmental Law	2	C	30	-
EMT 404	Waste Water Management	2	C	30	-
WMA 405	Hydro-Meteorological forecasting	3	C	30	45
WMA 406	Agro–Meteorological Methods and Applications	2	C	30	-
WMA 407	Agro-Met Instrumentation, observation, and Network Design	3	C	30	45
WMA 408	Tropical Weather Systems II	3	C	45	-
WMA 490	Project	6	C	-	270
	Total units	**21**			

Course Contents and Learning Outcomes

100 Level

GST 111: Communication in English (2 Units C: LH 15: PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents

Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and Usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation, and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (pre-writing, writing, post writing, editing, and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making, etc. Mechanics of writing). Comprehension strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. Explain the gradual evolution of Nigeria as a political unit;
4. Analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
5. Enumerate the challenges of the Nigerian State towards nation building;
6. Analyse the role of the judiciary in upholding people's fundamental rights;
7. Identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. List and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigeria people, trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual norms and values (basic Nigeria norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage and development; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values The 3R's – Reconstruction, Rehabilitation and Re-orientation. Re-orientation strategies: Operation Feed the Nation (OFN), green revolution, austerity measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), mass mobilization for self-reliance, social justice and economic recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

AGG 102: Introduction to Agriculture I (2 Units C: LH 30)

Learning Outcome

At the end of these lectures, students should be able to:

1. have a broad understanding of the concepts and dimensions of agriculture in modern times with emphasis on Nigeria and the tropics;
2. acquire basic knowledge and understanding of the roles of agriculture and the place of soil, crop and animal resources in the production process as well as the constraints they face;
3. be familiar with the role of technologies in the transformation of agriculture; and
4. explain potentials and constraints to sustainable agricultural production

Course Content

Meaning and Scope of Agriculture. Importance of Agriculture to an expanded economy. Agricultural Ecology. Genetics, Agronomy. Rocks and Soil formation. Soil and Water

Conservation. Soil Fertility. Land Preparation methods (soil tillage systems). Soil-water-plant relationship. Plant Forms and functions, Growth, Development and Reproduction. Plant Propagation Methods. Cropping Systems, Planting Patterns and Plant Densities. Crop Husbandry, Pasture and Forage Crops. Floriculture, Weeds, Crop Diseases, Crop Pests, Forest management (Silviculture), Crop Improvement, Animal Production, Forms and classification of major farm animals in West Africa, General terminology in animal production, Anatomy and physiology of farm animals, Reproduction in farm animals, Animal Nutrition, Livestock Management, Animal Health, Fisheries and Wildlife, Bee-keeping (Apiculture), Animal Improvement.

AGG 112: Introduction to Agriculture II (1 Unit C: LH 15)

Learning Outcome

At the end of these lectures, students should be able to:

1. Explain the history of agricultural development and the role of the public and private sectors.
2. Identify and analyse the factors of agricultural production and the role of various resources
3. Explain constraints of technology and mechanization, and the role of agricultural extension transformation.

Course Contents

History of Agricultural Development in West Africa, Roles of Government and NGOs in Agricultural Development, Factors of agricultural production, Basic Economic Principles, Characteristic Features of Agricultural Production, Labour Management, Farm Management, Marketing of Agricultural Produce, Agricultural Extension, Agricultural Technology, Farm surveying and farmstead planning, Simple Farm Tools, Farm machinery and implements, Mechanization and sources of farm power, Processing and storage, Introduction to biotechnology, Application of ICT in agriculture, Introduction to agricultural research and statistics.

BIO 101: General Biology I (2 Units C: LH 45)

Learning outcomes

At the end of lectures, students should be able to:

1. explain cell structure and organizations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents

Cell structure and organization. Functions of cellular organelles. Characteristics and classification of living things. Chromosomes, genes and their relationships and importance. General reproduction, interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism). Heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms). Elements of ecology and types of habitats.

BIO 107: General Biology Practical I (1 Units C: PH 45)

Learning Outcomes

At the end of the lectures, students should be able to:

1. outline common laboratory hazards;
2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

Course Contents

Common laboratory hazards. Prevention and first aid. Measurements in biology. Uses and care of microscope: compound and dissecting microscope. Biological drawings and illustration. Scaling, accuracy, and proportion. Use of common laboratory apparatus. Laboratory experiments designed to illustrate the topics covered in BIO 101.

CHM 101: General Chemistry I (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. define atom, molecules and chemical reactions;
2. discuss the Modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionisation energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation – reduction equation and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridized orbitals;
7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationships;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy; and
10. determine rates of reactions and their dependence on concentration, time, and temperature.

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence forces; Structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reaction, equilibrium, and thermodynamics. Acids, bases, and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II (3 Units C: LH 45)

Learning Outcomes
At the end of this course, the students should be able to:
1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of Transition metals.

Course Contents
Historical survey of the development and importance of organic chemistry; Fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures, and nano-chemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids, and derivatives. The chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning Outcomes
At the end of the course, students will be able to:
1. describe general laboratory rules and safety procedures;
2. collect scientific data and correctly carry out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. tell the differences between primary and secondary standards;
5. perform redox titration;
6. recording observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents
Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes
At the end of this course, the students should be able to:
1. identify general laboratory rules and safety procedures;

2. collect scientific data and correctly carry out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;
5. execute solubility tests on known and unknown organic compounds;
6. execute elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents
Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

MTH 101: Elementary Mathematics I (Algebra and trigonometry) (2 Units C: LH 30)

Learning Outcomes
At the end of the course students should be able to:
1. understand basic definition of set, subset, union, intersection, complements and use of venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. understand various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents
Elementary set theory, subsets, union, intersection, complements, venn diagrams. Real numbers; integers, rational and irrational numbers. Mathematical induction, real sequences and series. Theory of quadratic equations. Binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition, and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Learning Outcomes
At the end of the course students should be able to:
1. understand types of rules in differentiation and integration;
2. understand the meaning of function of a real variable, graphs, limits, and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents
Function of a real variable, graphs, limits, and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; integration as an inverse of differentiation. Methods of integration, definite integrals. Application to areas, volumes.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcomes

On completion, the student will be able to:

1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems based on the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents

Space and time; units and dimension. Vectors and scalars, differentiation of vectors. Displacement, velocity and acceleration; kinematics; Newton laws of motion (inertial frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion. Conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass. Rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes, and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits

PHY 102: General Physics II (Electricity & Magnetism) (2 Units C: LH 30)

Learning Outcomes

On completion, the student will be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of ac voltages and currents in resistors, capacitors, and inductors.

Course Contents

Forces in nature; electrostatics, electric charge and its properties. Methods of charging, Coulomb's law and superposition, electric field and potential, Gauss's law, capacitance, electric dipoles, energy in electric fields, conductors and insulators, current, voltage and resistance,

Ohm's law and analysis of DC circuits. Magnetic fields; Lorentz force, Biot-Savart and Ampère's laws, magnetic dipoles, dielectrics, energy in magnetic fields, electromotive force, electromagnetic induction, self and mutual inductances, Faraday and Lenz's laws. Step up and step-down transformers: Maxwell's equations, electromagnetic oscillations and waves, AC voltages and currents applied to inductors, capacitors, resistance, and combinations.

PHY 107/108: General Physics Practical I & II (2 Units C: PH 90)

Learning Outcomes
On completion, the student will be able to:
1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

Course Contents
This introductory course emphasises quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

200 Level

AGR 201: Principles of Crop Production (2 Units C: LH 30: PH 45)

Learning Outcomes
Students will be equipped with:
1. basic agronomic terminologies;
2. knowledge of and basis of crop distribution across climatic regions;
3. knowledge on crop grouping and distinct crop types;
4. introductory knowledge of soil and its classification; and
5. knowledge of soil management needs and some conservation practices

Course Contents
Definitions of the terms, crops, and plants (including weeds). Importance of crops and plants to mankind. Origin of different types of crops in tropical, sub-tropical and temperate climatic regions and introduction of crop types to other lands. Botany and basis for classification and/or grouping of crops. Descriptions of various types of crops (grains and legumes, cereal crops, root and tuber crops, tree crops, vegetables, ornamentals, etc.). Description (including diagrams) of crop growth cycle. Seeds and seed management and home gardening. Elements of crop husbandry and end-use technologies.
Definitions of the terms, soil and land. Elements of soil science and soil management. Importance of soils to mankind. Origin of soils. Jenny's factors and processes of soil formation. Descriptions (including diagrams) of the soil profile. The composition(s) of a normal soil. Soil types and basis for classification/grouping of soils. The soil textural triangle. Soil as a medium

for plant growth and concept of hydroponics. Soil fertility versus soil productivity. Soil conservation versus soil degradation. Interactive effects of soil characteristics on plants and animals. Soil water use and soil water balance

AGR 202 Introduction to Agricultural Economics, Extension and Rural Sociology (3 Units C; LH45)

Learning Outcomes

At the end of the course students will be able to:

1. explain basic economic theories, construct the supply and demand curves and use these to determine market equilibrium;
2. discuss the basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy;
3. define the concepts of international trade and balance of payment;
4. discuss the process of money creation and banking in the national economy;
5. explain the concept of welfare economics;
6. define and make valid comparison on agricultural extension methodologies world over;
7. categorize the major rural social institutions, processes, and the need for social changes in rural communities; and
8. explain the dynamics of leadership for social changes.

Course Contents

Explain basic economic theories, supply and demand curves and use of these to determine market equilibrium. Basic workings of the economy, national income determination from the output and income perspectives, and the condition for equilibrium of the national economy. Define the concepts of international trade and balance of payment. The process of money creation and banking in the national economy. Explain the concept of welfare economics. Define and make valid comparison on agricultural extension methodologies world over. Categorize the major rural social institutions, processes, and the need for social changes in rural communities. The dynamics of leadership for social changes.

AGR 203: Introduction to Forest Resources and Wildlife Management introduction to computer applications to water resources management and agro-meteorology (2 Units C: LH 30)

Learning Outcomes

The students will be able to:

1. enumerate the potentials of renewable natural resources;
2. identify important forest tree species as well as wildlife species in the various vegetation zones of Nigeria;
3. establish small scale bee farm, snail farm, cane rat farm;
4. elucidate the importance of forestry and wildlife to the national economy; and
5. raise seedlings of economic tree species.

Course Contents

Renewable natural resources, availability, distribution, and potentials. The important forest trees and wildlife. Organization of forest resources and non-timber resources. Classification, morphology, taxonomy and ecology of tropical forest trees and game reserves in Nigeria.

Silviculture, afforestation characteristics of major timbers and their uses. Forest production activities, forest protection and the regulation of harvest for sustained yield. Importance of forest in the national economy. Practical approach to apiculture, snailery, cane rat farming and other forest enterprises.

AGR 205: Introduction to Fisheries and Aquaculture (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students will be able to:

1. relate with different terminologies with regards to fish and fisheries, aquaculture production systems;
2. situate the importance of fisheries and aquaculture to the Nigerian economy, human nutrition, environment, and sociocultural systems;
3. describe linkages between fisheries and aquaculture;
4. explain the problems and principles of fisheries management and aquaculture;
5. describe the prospects and opportunities in fisheries management and aquaculture to individuals and the country;
6. situate and differentiate the various practices of fisheries management and different aquaculture practices;
7. gain fundamental knowledge underpinning the classification of fisheries and aquaculture by scale (small, medium, and large scales);
8. understand the fundamentals of fisheries management in relation to overfishing and sustainable development; and
9. list the types of management tools.

Course Contents

Concepts of fisheries and aquaculture in relation to natural resources. Water bodies and fisheries and aquaculture practices in Nigeria. Fish adaptation to aquatic life. The important fishes of West Africa with emphasis on Nigeria species. Classification, evolution, morphology, and basic structure of fishes. Life cycle of principal species of fishes. Significance of fishes in the life of Nigerians. The fish and aquaculture industries in Nigeria. Need for fisheries management and concept of overfishing. Fundamental principles of fish management (protection, conservation, and sustainable harvest) and production. Ecological, economic, and cultural importance of fisheries park, zoo, sport fishing, marine park etc. Scope of fisheries and aquaculture.

WMA 201: Agro-Meteorology, Biogeography and Climate Change (2 Units C: LH 30; PH 45)

Learning Outcomes

At the end of the course, students are expected to know the following:

1. the meanings of agro-meteorology, biogeography and climate change ;
2. the relationship between agro-meteorology, biogeography, hydrology, and climate change;
3. basic elements and factors of climate; and climate change variation characteristics
4. relationship between climate and plants, as well as climate and soils;
5. understand basic principles of climate change adaptation and mitigation
6. adaptation in plants and animals.
7. understand biodiversity and ecosystem sustainability, including bio-resource conservation.

Course Contents
Basic definitions and explanations in agro-meteorology and biogeography. The principles, aims and scope of agro-meteorology and biogeography. Relationships with agro-meteorology, biogeography and hydrology. Biodiversity and ecosystem sustainability. Principles of bio-resource conservation. Basic factors of climate formation, influence of relief on climate and plants. Geographical distribution of climatic elements, plants, and animals. Climate and soil. The concept of adaptation in plants and animals. Classification of climates and biogeography of the earth. The elements and control of climate and weather and the dynamics o the earth's atmosphere. Radiation and heating of the atmospheric systems, atmospheric moisture, and the dynamics of pressure and wind systems. Condensation and precipitation processes. The tropical climate, relation between agriculture and climate with reference to crop, livestock; irrigation, pest and diseases. Climate change and variation characteristics, impacts and adaptations, the importance of common short (e.g. august break, harmattan) and long seasons (dry and rainy seasons) on agriculture.

WMA 202: Elements of Geo-Science (3 Units C: LH 30: PH 45)

Learning Outcomes
At the end of lectures, the student should be able to understand the following:
1. the meaning, scope and approaches to geo sciences.
2. the composition and nature of the earth's system.
3. inter-relationship between the components of the earth surface
4. denudation processes on the earth surface
5. energy, energy transfer and biogeochemical cycles.

Course Contents
Definition, scope and approaches to Geo-science. The nature, composition, and classification of the earth's system (open systems, closed systems, matter, and energy classification of rocks). Environmental processes; the atmosphere, earth's-atmosphere, and energy system. The inter-relationship between the atmosphere, hydrosphere, lithosphere, biosphere, and man. Lithologic and hydrologic cycle, denudation processes, action of flowing water and erosion, flood plan features and characteristics of wetlands; deltas, classification of types of relief, biogeochemical cycle; man's interaction with natural environment and energy system. Composition of the earth's crust; minerals and rocks (classifications of rocks); Lithologic cycle; classification of types of relief; denudation processes; action of flowing water and erosion; flood-plain features, deltas; biogeochemical cycle.

WMA 203. Principles of Weather Forecasting for Agriculture (2 Units C: LH 30)

Learning outcomes
1. Understand basic definitions of weather forecasting
2. Weather patterns for forecasting
3. Methods for weather forecasting including the processes
4. Instruments for meteorological data collection for weather prediction
5. Know the numerical, computational and conceptual limitations of numerical weather prediction
6. Know the challenges of operational forecasting

7. Relevance of weather forecasting for agricultural planning

Course contents
Meaning of weather forecasting, importance, types of weather forecasting (short range, medium range and long range) and patterns. Methods for weather forecasting (synoptic, statistical, numerical weather prediction techniques). Model grid and weather forecasting processes. Various Numerical Models. numerical, computational and conceptual limitations of numerical weather prediction, Procedures and challenges for Operational forecasting, Relevance of forecasting for agriculture

300 Level

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. analyse the concepts of peace, conflict, and security;
2. list major forms, types and root causes of conflict and violence;
3. differentiate between conflict and terrorism;
4. enumerate security and peace building strategies; and
5. describe roles of international organizations, media and traditional institutions in peace building.

Course Contents
Concepts of peace, conflict, and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, and economic. Geo-political conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon. Boundaries/boarder disputes, political disputes, ethnic disputes, and rivalries. Economic inequalities, social disputes, nationalist movements, and agitations. Selected conflict case studies – Tiv-Junkun, Zango Kartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security. Peace & human development. Approaches to peace & conflict management --- (religious, government, community leaders, etc.). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales: constructive & destructive. Justice and legal framework: concepts of social justice; the Nigeria legal system, insurgency, and terrorism. Peace mediation and peace keeping. Peace & Security Council (international, national, and local levels). Agents of conflict resolution – conventions, treaties, community policing: evolution and imperatives. Alternative dispute resolution, ADR (a) Dialogue, (b) Arbitration, (c) Negotiation, and (d) Collaboration, etc. Roles of international organizations in conflict resolution: (a) The United Nations, UN, and its conflict resolution organs, (b) The African Union & Peace Security Council, (c) ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. Internally displaced persons, IDPs. The role of NGOs in post-conflict situations/crisis

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes
At the end of the course, students should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises;
7. conduct entrepreneurial marketing and e-commerce;
8. apply a wide variety of emerging technological solutions to entrepreneurship; and
9. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful e-commerce companies,). Small business management/family business: leadership & management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy *etc.* Digital business and e-commerce strategies).

WMA 301: Surface Hydrology (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students are expected to be able to:
1. perform computations and analysis of surface water flow;
2. explain hydrology of lakes;
3. understand and analyse simple and complex hydrographs; and
4. inflow and outflow of rivers and lakes.

Course Contents

Precipitation, analysis of data: Thiessen, Isohyetal and arithmetical method of computations. Detection of missing data, double mass curve, Intensity-Depth-Duration-frequency analysis. Evapo-transpiration, water budget and energy budget methods of determination of reservoir evaporation – Evapo-transpiration from climatological data –Penman method. Streamflow: Discharge volume and depth of runoff. Average annual runoff, seasonal runoff. Relation between water levels and discharges – rating curves. Stream-flow hydrograph. Overland flow. Unit hydrograph: derivation of unit hydrograph, synthetic unit hydrographs. Application of unit hydrographs. Sediment transport: Erosive action of rivers, suspended load and bed load. Lake

and reservoirs: hydrology of lakes and reservoirs. Inflow-outflow balance of lakes. Heat and temperature balance in lakes. Rivers, estuaries, Salinity, waves and current. Swamps and mashes. Principles of oceanography.

WMA 302: Ground water Hydrology (2 Units C; LH 30)

Learning Outcomes

At the end of lectures, students are expected to know the following:

1. the nature of water flow in aquifers;
2. types, design and maintenance of wells; and ground water forecasting.
3. the forms and sources of ground water;
4. ground water geology; and
5. surface and sub-surface methods of ground water exploration.

Course Contents

Origin, occurrence, and role of groundwater. Basic definitions of terms in groundwater studies, classification of aquifers; aquifer parameters, porosity, specific yield, permeability, transmissivity, storagetivity, anisotropy and heterogeneity. Groundwater geology; rock types and aquifers, geologic processes and aquifers; typical sedimentary rock aquifers. Exploration of groundwater, geological and geophysical methods (Surface and sub-surface). Equation of groundwater flow; Darcy's law and simple applications. Steady radial and rectilinear flows in aquifers.

Non-steady radial and rectilinear flows in aquifers. Well pumping tests. Theis and Jacob methods, multiple well systems. Types of wells, methods for well construction. Well drilling methods: Cable tool, rotary, and reserve rotary; well design, development, and maintenance. Evaluation of aquifer behavior and water quality. Analysis and interpretation of water level maps, laboratory determination of permeability, porosity, compressibility, and velocity of flow. Ground water in Nigeria, groundwater data analyses.

WMA 303: Hydro-Met Instrumentation and Network Design I (2 Units C: LH 30)

Learning Outcomes

Students are expected to know the following:

1. recording and interpretation of meteorological data;
2. principles and requirements for network design; and
3. data requirements for network design.

Course Contents

Meteorological data: sunshine hours, radiation, relative humidity, and wind speed. Precipitation: Location, recording and non-recording gauges. Evaporation and evapotraspiration. Pan evaporation, soil evaporimeters and lysimeters, short and long wave radiation, indirect methods. Network design: General principles for design of networks, general requirements, optimum network, minimum network, optimum use of existing stations in organizing a minimum network. Data to be considered in determining network density. Quality of data to be collected, density of observation, stations for a minimum network, Factors affecting the density, Minimum density limit of climatological networks.

WMA 304: Tropical Weather Systems I, Analysis and Predictions (2 Units C: LH 15: PH 45)

Learning Outcomes

At the end of the course, students are expected to know the following:

1. understanding meteorological tropics;
2. spatial and seasonal distribution of weather elements in the tropics;
3. tropical weather and implications on agriculture in the tropics;
4. low- and high-pressure belts of the tropics;
5. prediction of weather elements;
6. issues in the general circulation of the atmosphere; and
7. use of equations in atmospheric circulation analysis.

Course Contents

Definition of the meteorological tropics: General characteristics of the tropical atmosphere, spatial and seasonal distribution of weather elements in the tropics. Isolation and temperature air masses, sub-tropical anticyclones, cloudiness, rainfall and evapo-transpiration, radiation and water balance in the low attitudes. Implications for agriculture and water resources management of the tropics. Basic features of planetary scale motion in the tropic aspects for tropical circulation. The sub-tropical high-pressure cell (STHs) the trade winds, the equatorial though, the Southeast Asian monsoons, the westerlies. Effects on tropical climate and agriculture.

Principles of objective analysis and numerical weather prediction; observational statistic, prediction of individual weather elements. short range forecasting by various methods. Meso-scale analysis, convection systems, local winds, and other weather phenomena. Barotropic and baroclinic forecast; surface analysis, analysis of constant pressure surfaces and other surfaces; cross-section analysis, numerical computation of map factors and of geostropic winds; static stability computation, satellite data and other modern techniques. Formulation of basic equations of motion: vector from Cartesian coordinate, continuity equation hydrodynamic equation, equation of state. General circulation of the atmosphere: vorticity, divergence and deformation, static stability, circular vortex, and dynamics of mesoscace phenomena, atmospheric turbulence, and waves, small-scale turbulence

WMA 305: Principles of Dam Development and Management (2 units C LH 30)

Learning Outcomes

At the end of lectures, students are expected to know the following:

1. What dams are and their features
2. the uses of dam in sustainable development
3. The major dams in Nigeria and their locations
4. Farmers involvement in dam usage
5. The uses of dam and how they affect watershed management

Course Contents

Definition. Types of dams and their features (Diversion dam, Buttress dam, Detection dam,, Gravity dam). Uses of dam (domestic water supply, irrigation, flood control, hydro powertion,

inland navigation, fishing recreation). Major dams in Nigeria. General guidelines in maintenance of Dams. Dams and watershed management

WMA 306: Irrigation and Drainage (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students are expected to know the following:
1. understanding irrigation and drainage principles;
2. Planning scheme for sustainable crop production using irrigation methods in the tropics;
3. tropical weather and implications on agriculture in the tropics.

Course Contents
Collection and recording of meteorological data, Seasonal variations in temperature, day length, radiations, rainfall and evapotranspiration. Equipment and maintenance of meteorological stations. Land preparation for irrigation and operation of irrigation equipment, Land drainage systems

300 Level

(Agricultural Meteorology Option)

WMA 308: Agro – Meteorology (2 Units C: LH 15: PH 45)

Learning Outcomes
Students are expected to know the following:
1. instrumentation and observation of Agro-met indices;
2. moisture based indices of plant growth; and
3. evaluation of crop evaporation.
4. relationships between climate and agriculture;
5. factors in plant growth and distribution;
6. climate as it relates to plants, pests and diseases,
7. modification of microclimate.
8. qualitative and quantitative effects of solar energy on plants; and
9. wind, shelter, and moisture conservation on plant growth.

Course Contents
Focus of Agro-meteorology, Classification of Agro-meteorological indices. Instrumentation and method of observation of Agro-meteorological indices. The thermal based Agro-meteorological indices; Temperature (soil and air), radiation and photoperiods. The moisture-based indices; precipitation (rainfall, dew, fog), humidity evaporation and evapotranspiration. Evaluation of crop evaporation by lysimeters. Indirect estimation of evaporation, Penman, Thornthwaite, Blarnye-Criddle and Oliver's method. Installation of Agro-meteorological stations. Collection and recording of meteorological data; Equipment and maintenance of meteorological stations.
A general survey of climate-agriculture relationships: classification of Agro-meteorological indices. The concept of plant environment. The relationship between climate and plant's biophysical environment. Geomorphic, Edaphic and Biotic factors. Major climatic attributes in

plant and animal distribution. General climatic aspects of pests and diseases of plants and animals, forestry, fisheries, water resources, livestock production, crop storage and insect control. Water and energy budget of the plant environment. Modification of microclimate environment, modification of soil temperature regime rainmaking, evaporation suppression and wind speed checks.
The nature of climate-agriculture relationships and the methods of their investigation. Specific effects of moisture and thermal agro-meteorological indices on agricultural production. Effects of amount of spatial and temporal variation of precipitation (rainfall, dew, and fog). Insolation and photo-periodism, soil and air temperature, evapotraspiration, cloud, wind, and atmospheric humidity. Micro meteorological research in the boundary layer below plant canopies, crop phenology and microclimate. Quantitative and qualitative effects of solar energy received at the earth's surface, soil heat flux and soil temperature, carbon dioxide balance of the plants' environment, wind towers and estimation of boundary layer characteristics. Inter-relationships of wind shelter, moisture conservation and plant growth.

WMA 309: Agro-meteorology and Ecology (2 Units C: LH 15: PH 45)

Learning outcomes

At the end of the course, students should be able to:
1. Understand the main meteorological parameters
2. Carry out measurements with the most suitable instruments and process the results as well as calculate water balances and the water requirements of the main crops.
3. Acquires the basic knowledge of ecology to define its role in agricultural sciences.
4. Understood the concepts of interaction between plant organisms in agro-ecosystems to define the conditions of eco-sustainable agriculture;
5. Learns the elements to elaborate on the current environmental problems of agricultural interest.

Course Contents

The hydrological cycle and the water balance. Climate and climate indexes, climates. Climate change, adaptation and mitigation to the new climate. Definitions of ecological niche, habitat, biotope, biomes. Ecological significance and interactions between organisms: competition, resistance, resilience of an ecosystem. Determination of growth of plants in crops. Applications to agriculture, Plant-soil-atmosphere relations: stomata. Hailstorm.

WMA 310: Hydro-Met Instrumentation and Network Design (2 Units C; LH 15: PH 45)

Learning Outcomes

1. At the end of the course, students should be able to:
2. measurements of water levels in rivers, lakes and reservoirs;
3. stream flow computations;
4. quality control in lakes and reservoirs; and
5. water levels of rivers, lakes and reservoirs, Gauges and procedures for measurement of state.

Course Contents
Frequency of gauge measurements. Discharge measurements: by current meter, float method, dilution method. Measurement of correspondence stage by moving boat method, Ultrasonic methods, Electromagnetic methods, Stream gauging stations. Purpose: selection of sites, control sections, artificial controls, stage discharge relationships. Stream flow computation, computation of average gauges height, computation of average discharge, Quality control of stream flow data. Sediment discharge: measurement of suspended sediment discharge, measurement of bed-sediment discharge. Collection, processing, and publication of data. Collection and observation procedures. Transmission of hydrological and meteorological observations. Quality control, storage and cataloging. Special data collection requirement: 'bucket surveys' of storm rainfall, weather radar data. Extreme stages and discharges.

WMA 304: Tropical Weather Systems I, Analysis and Prediction (2 Units C: LH 30; PH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. understanding meteorological tropics;
2. spatial and seasonal distribution of weather elements in the tropics;
3. tropical weather and implications on agriculture in the tropics;
4. low- and high-pressure belts of the tropics;
5. prediction of weather elements;
6. issues in the general circulation of the atmosphere; and
7. use of equations in atmospheric circulation analysis

Course Contents
Definition of the meteorological tropics: General characteristics of the tropical atmosphere, spatial and seasonal distribution of weather elements in the tropics. Isolation and temperature air masses, sub-tropical anticyclones, cloudiness, rainfall and evapo-transpiration, radiation and water balance in the low attitudes. Implications for agriculture and water resources management of the tropics. Basic features of planetary scale motion in the tropic aspects for tropical circulation. The sub-tropical high-pressure cell (STHs) the trade winds, the equatorial though, the Southeast Asian monsoons, the westerlies. Effects on tropical climate and agriculture.
Principles of objective analysis and numerical weather prediction; observational statistic, prediction of individual weather elements. short range forecasting by various methods. Meso-scale analysis, convection systems, local winds, and other weather phenomena. Barotropic and baroclinic forecast; surface analysis, analysis of constant pressure surfaces and other surfaces; cross-section analysis, numerical computation of map factors and of geostropic winds; static stability computation, satellite data and other modern techniques. Formulation of basic equations of motion: vector from Cartesian coordinate, continuity equation hydrodynamic equation, equation of state. General circulation of the atmosphere: vorticity, divergence and deformation, static stability, circular vortex, and dynamics of mesoscace phenomena, atmospheric turbulence, and waves, small-scale turbulence.

WMA 304: Weather Forecasting for Agricultural Planning (2 Units C: LH 15; PH 45)

Learning Outcomes

1. outline the main components of numerical weather prediction systems;
2. understand the history of numerical weather system;
3. discuss applications for data assimilation;
4. use and analyze techniques to verify forecasts;
5. analyze ensemble forecasts and discuss atmospheric predictability;
6. understand common parametization schemes for calculation of turbulent fluxes, clouds parameter and moist convection; and
7. how to apply weather forecast to agricultural planning.

Course contents

History of numerical weather prediction and climate modelling .Variables for weather forecasting (precipitation, temperature, relative humidity, etc.) how forecast are produce and evaluated with strong emphasis on simulation and forecasting of weather systems, data assimilation, forecast verification, sensitivity to initial condition and assemble predictions. In this, the element of numerical models for weather and climate predictions are explained and guidance for their interpretation giving. Connective-scale weather forecasting systems of MET Norway,understanding its characteristics and its disseminitation. Weakness and caveat associated with numerical scales, model grids and parametized processes. Importance of Weather forecast for agricultural planning

WMA 308: Practical Year Experience Report (1 Unit C: PH 45)

Learning Outcomes

At the end of the course, students will be able to:

1. have practical experiences in water resources management, such as treatment, quality control, hazards control and management, etc.; and
2. perform recording, prediction and forecasting of climatic data

Course Contents

Practical experience and participation in water supply exploration and exploitation, water quality analysis or determination, water treatment procedures, water conservation practices, erosion and flood control (such as, dam structures and function, Irrigation design and scheduling, at least two irrigation system practices (such as, surface sprinkler or drip irrigation), installations and use, hydraulic design, practices and use, watershed Management. Practical exposure to the application of weather and climate to specific problem of agriculture–farming, ranching, Fisheries Poultry Farming and Forestry as well as determination of irrigation requirements. Practical experience and participation in climate monitoring and prediction involving documenting, monitoring and accessing the climate characteristics over the assigned plant environment/geographical area; preparing climate summaries and prediction usually for seasonal to inter-annual time scales, Hydrological, Meteorological and Agro-meteorological Instrumentation and Network design involving operating and controlling the network, specifying and standardizing instruments and method of observation, calibrating, maintaining and repairing instruments; assembling and processing of incoming observational data, creating data

set for weather analysis and forecasting, archiving specific data set and delivery to users on the farm, in Water Board, Agro-allied Industries, Hospitals, Marine and Coastal areas.
Students should be assessed based on seminar presentation, their reports and assessment by their supervisors.

400 Level

EMT 401: Environmental Law (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students are expected to know the following:
1. basic laws on the environment;
2. Federal, State and International laws on the environment; and
3. regulations and enforcement mechanisms of environmental laws.

Course Contents
Basic concept of environmental standard criteria and regulation. Federal environmental laws on environment protection. States edict and regulation on the environment, plant, and animal quarantine. Regulations and enforcement mechanisms, violations, and sanctions. Comparative study of environmental laws in some advance countries, such as, USA, Canada, Thailand, etc. International Laws and conventions.

EMT 404: Waste Water Management (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students are expected to know the following:
1. types and characteristics of toxicants;
2. collection of samples for toxicant analysis;
3. methods of analysis of waste water; and
4. quality assurance in water for different purposes.

Course Contents
Types, nature and characteristics of toxicants, sampling of air, soil, water, and other ecological materials particularly using a staplex sampler at different flow rates and other modern methods. Sample preservation and preparation techniques. Samples collection techniques of air, soil, water, food, blood etc. Analytical methods for toxicants. Instrumental neutron. Activation analysis. Atomic absorption spectrophotometer UV/Visible spectrophotometer. Gas chromatograph hybrid methods such as, GC/Mass spectrometer. Auto-analyser chemical separation methods. Gas analysers. Quality assurance of analytical data statistical treatment of data. Interpretation of data.

WMA 405: Hydro – Hydro-Meteorological Forecasting (3 Units C: LH 15: PH 45)

Learning Outcomes
At the end of the course, students are expected to know the following:
1. statistical methods in climate and meteorology;
2. forecasting methods in hydro–meteorology;

3. formulation and evaluation of forecasting methods; and
4. cost-benefit analysis of Hydro-Met forecasting.

Course Contents
Statistical methods in climatological and meteorological studies. Application of statistics in decision-making and objective analysis of boundary layer climatology. Weather analysis and forecasting reviews. ritical appraisal of forecast methods and products. Hydrological forecasts and warnings. Classification of hydrological forecasts, Hydrological forecasting services, operations, organization, collection of data and issue of forecasts and warnings, use of radar observation for meteorological and Hydrological forecasting services.

WMA 406: Agro-Meteorological Methods and Applications (2 units C: LH 30)

Learning Outcomes
At the end of the course, students are expected to know the following:
1. statistical methods of agro-met applications;
2. climatological series in agro-met applications; and
3. computations and computer programming.

Course Contents
Agro-meteorological statistics and models for prediction: random variables and probability theory, probability (prior-posterior) likelihood, Baye's theorem, independent, joint, conditional probabilities. Climatological series. description of population by means of frequency distribution. Estimation problems: empirical frequency estimates, parametric estimation, etc.; test of hypothesis, relationship problems (correlation, simple and multivariate distributions, and correlation, regression (Linear, non-linear, multiple significant, non-significant regression coefficients in adjusted relations; discriminate analysis, factor analysis; time series: stochastic processes, Markov chain, and spectral analysis. Computations: digital computers; programming; numerical models, etc.

WMA 407: Agro-Meteorological Instrumentations, Observation and Network Design (3 Units C; LH 30: PH 30)

Learning Outcomes
At the end of the course, students are expected to know the following:
1. rules and procedures of met observations and instrumentation;
2. biological and phonological observations; and
3. instruments and methods of observation.

Course Contents
General rules and procedures of meteorological observations and instrumentation (instrumentation, observation and recording of pressure, and temperature, atmospheric humidity, wind, sunshine and radiation, precipitation, soil temperature, soil moisture content and soil moisture tension, evaporation, evapo-transpiration, interpretation and analysis of autographic charts, cloud classification, estimation of cloud base, etc.). Biological/phonological observations, (observation of soil condition, native plants, cultivated crops and trees, farm animals, diseases, and pests). Instruments and method of observation: the choice of a site for

an instrument enclosure, procedures for installation, maintenance, checking and calibration of instruments used in agricultural meteorology.

WMA 408: Tropical Weather Systems II (3 Units C; LH 45)

Learning Outcomes
At the end of the course, students are expected to know the following:
1. trends and advances in tropical weather systems;
2. tropical storm development; and
3. tropical weather systems and human health.

Course Contents
Trends in the study of tropical weather systems. Recent advances in the study of low altitude weather systems. The mean state of the tropical atmosphere. The major producing systems in the tropics, tropical cyclones, tornadoes, monsoon depressions, easterly wages, thunderstorms, synoptic disturbances in the tropics. The disturbance line of West Africa. Inter-tropical convergence zone (ITCZ). Designation of tropical storm development regions. Models of prediction in the tropics – the single and multi-level models. Stratospheric ozone depletion, El Nino and La Nina phenomena, relationship with tropical cyclone in the tropics and their typical global impacts. Application of tropical weather systems to human health, food, and water supply, building designs and urban planning. Global climate change and tropical climate. Drought and desertification in the tropics.

WMA 499: Project (6 Units C; PH 270)

Learning Outcomes
At the end of the course, students are expected to have
1. Participated in a special project relating to water resources management or agro-meteorology.

Course Contents
Each student is required to choose and execute a special project under a supervisor. Duration of the project is a minimum of two semesters. Typed and bound project reports to be submitted at the end of project.

Minimum Academic Standards

Equipment
1. Water level indicator
2. Portable pH meter
3. Stirrers
4. Spectrophotometer
5. Hatch portable water test kit
6. Dissolved oxygen meter (complete set)
7. Portable Water Analyzer
8. Salinity bridge measuring instrument
9. Pipettes 5ml, 10ml, 25ml

10. Evaporating dishes 200ml, 500ml
11. Round bottomed Flask 250ml, 1000ml
12. Flat bottomed flask 250ml, 1000m
13. Test tubes 16 x 125ml, 16x150ml, 12 x 98ml
14. Funnel Polystyrene
15. Wash bottles
16. Aspirator
17. Hydrometer
18. Burettes 50ml
19. Reagent bottle 250ml, 500m
20. Thermometer 0-110oc, 0-250oc, 0-360oc,
21. Water pump
22. Horizontal Drum Water level (key float drum)
23. Soil hydrometer
24. Cone penetrometer with test cup
25. Class 'A' pan evaporation with Hook gauge and still wel
26. Stevenson's screen
27. Campbell stroke sunshine recorder
28. Thermohygrograpy
29. Dry and Wet-bulb thermometer
30. Ordinary Rainguage
31. Automatic rainguage
32. Minimum and Maximum Thermometer
33. Soil Thermometer
34. Wind Vane
35. Prismatic compass
36. GPS (5)
37. K l-M theodolite
38. Tripod kern for Theodolite DKM – 2 – A
39. Ranging poles
40. Stop Watches
41. Water analysis chemical
42. Sunshine records card
43. Thermograph charts
44. Soil Moisture meter

Staffing

Academic staff

The NUC guidelines on staff/student ratio of 1:15 for for the agriculture discipline applies to the programme. Also, there should be a minimum of six full-time equivalent of staff in the department. There is need to have a reasonable number of staff with doctoral degrees as well as sufficient industrial/practical experience. With a minimum load of 18 Units per semester for students and a minimum of six full-time equivalent of staff in each sub-discipline or specialization areas. Staff should have a maximum of 15 contact hours per week for lectures, tutorials, practical and supervision of projects.

For the programme, the academic staff number should be as *per* the National Universities Commission (NUC) guidelines. The academic staff pyramid should be composed as follows-

1. Professor/Reader - 20%
2. Senior Lecturer - 35%
3. Lecturer 1 and below- 45%

Technical support personnel

The services of technical support staff, which are indispensable in the proper running of laboratories and workshop/studios are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance. The minimum of academic staff to technical staff ratio of 5:1 should be maintained.

Library

A hall should be provided for a physical library that can contain at least fifty users at a sitting. This should be well equipped with books, journals and materials that are relevant and up to date, for the use of both students and staff of the department.

In addition, there should also be a virtual library, capable of containing at least 40 users at a sitting. This library should have up to date subscriptions and relevant software installed.

Classrooms, Laboratories, Workshops and Offices

There should be a minimum of four well equipped classrooms and a lecture hall.

Laboratories

There should be at least two laboratories for water analysis and hydrology.

Weather Stations

There should be a standard manual Meteorological station with all the equipment, as well as an automatic weather station for practical purposes.

Offices

Office space should be provided for each academic, technical and administrative staff in square meters as follows

Professor	18.50
Head of Department	18.50
Tutorial Teaching Staff	13.50
Other Teaching Staff	7.00
Technical Staff	7.00
Secretarial space	7.00
Academic staff research laboratory	6.50
Seminar space/per student	1.85
Laboratory space	7.00

Vehicles

There should be a bus and another vehicle for the use of the department.