# FEDERAL UNIVERSITY WUKARI, TARABA STATE,

# DEPARTMENT OF AGRICULTURAL ENGINEERING

# STUDENTS HAND BOOK

**2023**

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Abuja.

**Joint Admission and Matriculation Board (JAMB)**
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**Federal Scholarship Board**
Federal Ministry of Education
Shehu Shagari Way
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## FUW ANTHEM

Coming all the way long
Reaching for the utmost height
Building Character
Living in an excellent way
Serving humanity with integrity of heart
Lifting our nation high

**Chorus:**
*We have all it takes*
*Great F.U.Wukari*
*Good character*
*Excellent living*
*Heart of service*
*To lift our nation high*

Arise! Oh the great croc
Working as the ant would do

Building a varsity
The pride of our nation
Marching towards the mark
Never looking back
Lifting our nation high

## VISION AND MISSION OF THE UNIVERSITY

**Vision**

The vision of the Federal University Wukari is to be a leader among world class public universities by advancing knowledge through high quality educational experiences for students that are ICT centric; encouraging and fostering entrepreneurship, conducting leading edge research and scholarship in all areas that would lead to the betterment of human condition and also by promoting an intellectual environment that is anchored on the tenets of excellence, open dialogue and inquiry, and a deep and abiding appreciation for the entire spectrum of human experience.

**Mission**

The mission of the Federal University Wukari is anchored around the following tenets: to be a student-centre and community-engaged institution by providing an enabling environment that enhances intellectual growth, a strong commitment to academic excellence, integrity and entrepreneurship; creating new knowledge and using ICT and other enabling technologies to solve practical problems that benefit humanity; preparing our students as well as professionals in our community for ethical leadership; and promoting service to community and an enduring sense of global citizenship.

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# CHAPTER ONE

## 1.0 INTRODUCTION

The Department of Agricultural Engineering is one of the pioneer Academic Departments of the Faculty of Engineering, Federal University Wukari. The Department runs degree programme leading to the award of the Bachelor of Engineering (B. Eng) with option in Farm Power and Machinery Engineering, Soil and Water Engineering, Food Processing and Storage Engineering (Post-harvest technology) and Farm Structures and Environmental Control, Forestry and Wood Products Engineering and Food Process Engineering.

## 1.1 Philosophy

Our philosophy is to produce engineering graduates with state-of-the-art knowledge of both the theoretical and practical aspects of Agricultural Engineering, with the view to graduating competent engineering professionals that are self-reliant, innovative and problem solvers. The programme is designed to prepare students for careers in machine systems: design and provision of power for agricultural machines including renewable energies and design of machines for crop and livestock production; processing systems for food, biofuels and other by-products: crop processing and storage and post-harvest handling; natural resources system: irrigation and drainage, erosion control and water conservation; environmental system: farm structures, waste remediation and farm electrification; biological system: sensors, controls and computer models to monitor biological processes and conversion of bio-based resources to food, fuel, flavors and value-added products. It is thus very wide and all encompassing.

## 1.2 Mission

Our mission is to raise dynamic and sound Agricultural Engineers who are innovative, independent, problem solvers and confident

## 1.3 Vision

Our vision is to develop a Department that graduates students that compete favorably with other graduates across the globe. The department will focus on cutting edge research and teachings in line with global best practice.

## 1.4 Admission Requirements

### 1.4.1 Admission into 100 Level

The minimum entry requirement for admission into the Department of Agricultural Engineering is 5 Credits at SSCE, GCE "O" Level, NECO and NABTEB including English Language, Mathematics, Chemistry, Physics and Biology/Agricultural Science and an acceptable score in the Unified Tertiary Matriculation Examination (UTME), the candidate shall be required to pass the University post UTME screening test before being admitted.

### 1.4.2 Admission by Direct Entry

Applicant with at least 2' A Level passes at GCE or its equivalent in relevant subjects, OND/ND (Upper Credit), HND or NCE at credit level in Agricultural Engineering or any related course, provided such candidate satisfy the requirement for admission through UTME.

## 1.5 Graduation Requirements

To qualify for the award of Bachelor of Engineering (B. Eng) in Agricultural Engineering, a student must pass a minimum of 165 Credit Units .

## 1.6 Degree Classification

The following regulations shall govern the conditions for the award of a degree:

i. Candidate admitted through the UTME mode shall have registered for the minimum credit units of courses in his/her discipline during the 5-year degree programme.
ii. Candidates must have registered and passed all compulsory and required courses as well as the number of elective courses specified for the programme.

The determination of the class of degree shall be based on the Cumulative Grade Point Average earned at the end of the programme. The GPA is computed by dividing the total number of credit points (TCP) by the total number of units (TNU) for all the courses taken in the semester.
The CGPA shall be used in the determination of the class of degree as summarized in Table 1.
It is important to note that CGPA shall be calculated and expressed correctly to two decimal places. The maximum length of time allowed to obtain a degree in the department shall be fifteen semesters for the 5-year degree programme, twelve semesters for 4- year degree programme and nine semesters for students admitted as direct entry students at 300 level. For extension beyond the maximum period, a special permission of Senate shall be required on the recommendation of the Departmental and Faculty Boards.

**Table 1:** Degree classification

| Cumulative Grade Point Average (CGPA) | Class of Degree |
|---|---|
| 4.50 – 5.00 | First Class (Hons) |
| 3.50 – 4.49 | 2nd Class Upper (Hons) |
| 2.40 – 3.49 | 2nd Class Lower (Hons) |
| 1.50 – 2.39 | 3rd Class (Hons) |

## 1.7 Student Performance Standards

(a) Students will be expected to register for between 15 -24 credit Units per semester.

(b) The minimum CGPA to proceed from 100 - 200 Level shall be 2.00

(c) From 200 - 500 Level, the minimum CGPA to proceed to the next Level shall be 1.50.

### 1.7.1 Probation

A student whose Cumulative Grade Point Average is below 1.50 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 his failed courses at that level and lower levels only.

### 1.7.2 Withdrawal

A candidate whose Cumulative Grade Point Average is below 1.50 at the end of a particular year of probation shall be required to withdraw from the Department. However, in order to minimize waste of human resources, consideration should be given to transfer to other programmes within the University.

### 1.7.3 Students on transfer

Students with a CGPA of 3.50 and above from Science-based Faculties who desire to transfer into any of the programmes in Engineering shall be considered based on merit and relevance of Courses already taken and passed.

Students who transfer from other universities with a CGPA of not less than 3.50 shall be credited with only those courses, deemed relevant to the programme. 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 Department; provided that no student shall spend less than two sessions (4 semesters) in order to earn a degree. Students who transfer for any approved reason shall be credited with those units passed that are within the curriculum. Appropriate decisions on transfer cases shall be subjected to the approval of Senate on the recommendation of the Department and Faculty.

### 1.7.4 Course credit system

Agricultural Engineering programme shall be run on a modularised system, commonly referred to as Course Unit System. All courses would 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. Credit weights would be attached to each course. One credit is equivalent to one hour per week per semester of 15 weeks of lectures or 2 hours of tutorials or 3 hours per week of laboratory/studio work per semester of 15 weeks.

### 1.7.5 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 2

**Table 2:** Grade point system

| **Mark %** | **Letter Grade** | **Grade Point** |
|---|---|---|
| 70 – 100 | A | 5 |
| 60 – 69 | B | 4 |
| 50 – 59 | C | 3 |
| 45 – 49 | D | 2 |
| 40 – 44 | E | 1 |
| < 40 | F | 0 |

### 1.7.7 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 3.
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 3:** Calculation of GPA or CGPA

| **Course** | **Units** | **Grade Point** | **Units x Grade Point (TUGP)** |
|---|---|---|---|
| $C_1$ | $U_1$ | $GP_1$ | $U_1$ x $GP_1$ |
| $C_2$ | $U_2$ | $GP_2$ | $U_2$ x $GP_2$ |
| - | - | - | |
| - | - | - | |
| Ci | Ui | $GP_i$ | Ui x GPi |
| - | - | - | |
| - | - | - | |
| $C_N$ | $U_N$ | $GP_N$ | $U_N$ x $GP_N$ |
| **TOTAL** | **TNU** | | **TUGP** |

**GPA =TUGP/TNU**

## 1.8 Evaluation

### 1.8.1 Techniques of student assessment

#### *1.8.1.1 Practicals*

By the nature of the disciplines in Engineering, laboratory practicals are very important in the training of the students. To reflect this importance of practical work, a minimum of 9 hours per week (3 credits) should be spent on students' laboratory practicals. Furthermore, it is very important to determine performance of the student in the practical component of the programme. To achieve this, all the laboratory practicals have been lumped together to form a course which the student must pass. It is expected that the weighting given in the various courses is reflected in number and nature in the design of the experiments. These practicals must follow the trend in the current development of the programme.

#### *1.8.1.2 Tutorials*

There should be one hour of tutorial for every four hours of lecture. Thus, a course of one credit unit should comprise 12 hours of lecture and three hours of tutorials.

#### *1.8.1.3 Continuous Assessments*

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

(i) Scores from continuous assessment shall normally constitute 30% of the final marks for courses which are primarily theoretical.
(ii) For courses which are partly practical and partly theoretical, scores from continuous assessment shall constitute 50% of the final marks.
(iii) For courses that are entirely practical, continuous assessment shall be based on a student's practical work or reports and shall constitute 100 % the final marks.

### *1.9.1.4 Examinations*

In addition to continuous assessment, final examinations should normally be given for every course at the end of each semester. The final grade would be based on the following breakdown.

Final Examination: 60% - 70%
Continuous assessment (Quizzes, Tutorials, Homework, Tests): 30% - 40%

(i) Each course shall normally be completed and examined at the end of the semester in which it is offered.
(ii) A written examination shall normally last a minimum of one hour for one unit course.

### *1.8.1.5 External Examiners' System*

The external examiner system would be used only in the final year of the undergraduate programme to assess final year courses and projects, and to certify the overall performance of the graduating students, as well as the quality of facilities and teaching.

### *1.8.1.6 SIWES Rating and Assessment*

In Engineering education, industrial attachment is very crucial. The minimum duration of this attachment should be 34 weeks (one semester and 2 long vacations) and would be broken into the following modules: Students Work Experience (SWEP) Programme (10 weeks – long vacation); Students Industrial Work Experience Scheme (SIWES) (24 weeks, one semester plus long vacation).

To make the training effective, it is important that the students learn how to operate some of the ordinary machines and tools they will encounter in the industry before they go for the attachment. Therefore, they would start with SWEP, which is conducted in the Faculty Workshops, under strict industrial conditions. On successful completion of SWEP, the Students Industrial Work Experience Schemes would be done in industries under strict industrial conditions and supervision.
Normally, industrial attachment would be graded, and no student should graduate without passing all the modules of the attachment and this should be used in degree classification.

### *1.8.1.7 Students' Evaluation of Courses*

There is an established avenue put in place offering opportunity to students to evaluate courses delivered to them at the end of each semester. This is an integral component of the course credit system, serving as feedback mechanism for achieving the following:

i) Improvement in the effectiveness of course delivery.

ii) Continual update of lecture materials to incorporate emerging new concepts.

iii) Effective usage of teaching aids and tools to maximize impact of knowledge on students.

iv) Improvement in students' performance through effective delivery of tutorials, timely in presentation of continuous assessment and high-quality examination.

In order to achieve effective learning, all students should normally be permitted to evaluate those courses registered at the end of each semester, 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, maintain confidentiality demanded by such exercise and apply their scientifically processed outcome to improving effective course delivery in all ramifications.

## 1.10 Definition of Terms

### i. Core/Compulsory Course

A course which every student must compulsorily take and pass in any programme at a particular level of study.

### ii. Required Course

A course that you take at a level of study and must be passed before graduation.

### iii. Elective Course

A course that students take within or outside the faculty. Students must pass all elective courses before they can graduate

### iv. Course

A course which students can take based on interest and may count towards the minimum credit unit required for graduation.

### v. Pre-requisite Course

A course which student must take and pass before taking a particular course at a higher level.

### vi. Minimum and Maximum Credit Load Per Semester

The Minimum credit load per semester is 15, while the maximum is 24.

### vii. Course Credit Unit 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 difficulty or in levels of academic progress, e.g. Level or year 1 courses are 100, 101 etc. and Level II or Year II courses are 200, 202 etc. The second aspect of the system is that courses are assigned weights through Credit Units.

### viii. Grade Point Average (GPA)

Performance in any semester is reported in Grade Point Average. This is the average of weighted grade points earned in the courses taken during the semester. The Grade Point Average is obtained by multiplying the Grade Point in each course by the number of Credit Units assigned

to that course, and then summing these up and dividing by the total number of Credit Units taken for the semester.

### ix. Cumulative Grade Point Average (CGPA)

This is the up-to-date mean of the Grade Points earned by the student in a programme of study. It is an indication of the student's overall performance at any point in the training programme. To compute the Cumulative Grade Point Average, the total of Grade Points multiplied by the respective Credit Units for all the semesters are added and then divided by the total number of Credit Units for all courses registered by the student.

## CHAPTER TWO

## 2.0 Department of Agricultural Engineering

### 2.1 Course Codes and Titles

**100 LEVEL**

**First semester**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | CHM 101 | General Chemistry I (Physical & Inorganic Chemistry) | 3 | Core |
| 2 | CHM 107 | Practical Chemistry I | 1 | Core |
| 3 | MTH 101 | General Mathematics I | 3 | Core |
| 4 | PHY 101 | General Physics I | 3 | Core |
| 5 | PHY 103 | General Physics III | 2 | Core |
| 6 | PHY 107 | Practical Physics I | 1 | Core |
| 7 | CSC 101 | Introduction to Computer Science | 3 | Core |
| 8 | GST 101 | Communication in English I | 2 | Core |
| 9 | GST 107 | Use of Library, Study Skills and Information Communication Technology (ICT) | 2 | Core |
| 10 | GEN 101 | Introduction to Engineering Statistics | 2 | Core |
| | | **Total** | **22** | |

**Second semester**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | CHM 102 | General Organic Chemistry | 2 | Core |
| 2 | CHM 104 | Inorganic Chemistry I | 2 | Core |
| 3 | CHM 108 | Practical Chemistry II | 1 | Core |
| 4 | MTH 102 | General Mathematics II | 3 | Core |
| 5 | MTH 104 | Elementary Vectors, Geometry and Mechanics | 3 | Core |
| 6 | PHY 102 | Electricity and Magnetism | 3 | Core |
| 7 | PHY 108 | Practical Physics II | 1 | Core |

| | | | | |
|---|---|---|---|---|
| 8 | GST 102 | Communication in English II | 2 | Core |
| 9 | CSC 104 | Computer Programming, I | 2 | Core |
| 10 | GST 108 | Communication in French (Elective) | 2 | Elective |
| 11 | GST 110 | Communication in Arabic (Elective) | 2 | Elective |
| | | **Total** | **21** | |

## 200 LEVEL

**First semester**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | EEE 203 | Applied Electricity I | 2 | Core |
| 2 | MEE 209 | Engineering Drawing, I | 2 | Core |
| 3 | MEE 211 | Students Workshop Experience I | 1 | Core |
| 4 | MEE 205 | Applied Mechanics I | 3 | Core |
| 5 | MEE 207 | Engineering Materials | 3 | Core |
| 6 | EMA 201 | Engineering Mathematics I | 3 | Required |
| 7 | CIE 203 | Strength of Materials I | 3 | Core |
| 8 | GEN 201 | Engineer in Society | 1 | Required |
| 9 | GEN 203 | Basic Engineering Laboratory I | 2 | Required |
| 10 | GST 201 | Philosophy, Logic and Human Existence | 2 | Required |
| 11 | GST 203 | Nigerian Peoples, Culture and Citizenship | 2 | Required |
| | | **Total** | **24** | |

**Second semester**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | EEE 202 | Applied Electricity II | 2 | Core |
| 2 | MEE 212 | Engineering Drawing II | 2 | Core |
| 3 | MEE 214 | Fundamentals of Fluid Mechanics | 3 | Core |
| 4 | MEE 216 | Applied Mechanics II | 2 | Core |
| 5 | MEE 218 | Engineering Thermodynamics I | 3 | Core |
| 6 | EMA 202 | Engineering Mathematics II | 3 | Required |
| 7 | AGE 202 | Agricultural and Bio-resources Engineering Concept | 1 | Core |
| 8 | GEN 204 | Basic Engineering Laboratory II | 2 | Required |
| 9 | GST 204 | History and Philosophy of Science | 2 | Required |
| 10 | GST 206 | Peace Studies and Conflict Resolutions | 2 | Required |

| | | | | |
|---|---|---|---|---|
| 11 | AGE 200 | SWEP I | 2 | Core |
| | | **Total** | **24** | |

## 300 LEVEL

**First semester**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | AGE 301 | Basic Agricultural and Bio-Resources Engineering | 2 | Core |
| 2 | AGE 303 | Hydrology | 3 | Core |
| 3 | AGE 305 | Hydraulics | 2 | Core |
| 4 | CIE 301 | Land Surveying | 3 | Core |
| 5 | MEE 301 | Mechanics of Machines | 2 | Core |
| 6 | SSL 301 | Soil Pedology and Physics | 2 | Required |
| 7 | CIE 303 | Soil Mechanics | 2 | Core |
| 8 | EMA 301 | Engineering Mathematics III | 3 | Required |
| 9 | AGE 307 | Agricultural Engineering Laboratory/Field Practical I | 2 | Core |
| 10 | GST 301 | Introduction to Entrepreneurship Studies | 2 | Required |
| | | **Total** | **23** | |

**Second semester**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | CIE 302 | Geology for Engineers | 2 | Required |
| 2 | AGE 302 | Machine Drawing and Design | 2 | Core |
| 3 | MEE 302 | Engineering Metallurgy | 2 | Required |
| 4 | APH 202 | Principles of Animal Production | 2 | Required |
| 5 | CPP 202 | Principles of Crop Production | 2 | Required |
| 6 | GEN 302 | Engineering Communication | 2 | Required |
| 7 | EMA 302 | Engineering Mathematics IV | 3 | Required |
| 8 | AGE 308 | Agricultural Engineering Laboratory/Field Practicals II | 2 | Core |
| 9 | GST 302 | Introduction to Entrepreneurial Skills | 2 | Required |
| 10 | AGE 300 | SWEP II | 2 | Core |
| | | **Total** | **21** | |

## 400 LEVEL

**First semester**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | AGE 401 | Farm Power and Machinery | 3 | Core |
| 2 | AGE 403 | Irrigation and Drainage Principles | 3 | Core |
| 3 | AGE 405 | Farm Structures and Environmental Control | 3 | Core |
| 4 | AGE 407 | Properties, Handling, Processing and Storage of Agricultural Materials | 3 | Core |

| | | | | |
|---|---|---|---|---|
| 5 | AGE 409 | Agricultural Engineering Laboratory Practical III | 2 | Core |
| 6 | GEN 401 | Engineering Economics | 2 | Required |
| 7 | GEN 301 | Engineering Statistics | 2 | Required |
| 8 | AGE 411 | Farm Management, Rural Sociology and Agricultural Extension | 2 | Core |
| | | **Total** | **20** | |

**Second semester**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | AGE 400 | Students Industrial Work Experience Scheme (SIWES) | 6 | Core |
| | | **Total** | **6** | |

## 500 LEVEL

**First semester**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | AGE 501 | Seminar | 2 | Core |
| 2 | GEN 501 | Engineering Management | 3 | Core |
| 3 | AGE 503 | Farm Electrification | 3 | Core |
| 4 | AGE 505 | Soil and Water Conservation | 3 | Core |
| 5 | AGE 507 | Land Clearing and Development | 2 | Core |
| 6 | AGE 509 | Agricultural Mechanization | 2 | Core |
| 7 | AGE 511 | Environmental Engineering | 3 | Core |
| 8 | AGE 597 | Project I | 2 | Core |
| | | **Total** | **20** | |

**Second semester**

**Core Courses**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | GEN 502 | Engineering Law | 2 | Core |
| 2 | AGE 502 | Waste Management Engineering | 3 | Core |
| 3 | AGE 598 | Project II | 4 | Core |

**Farm Power and Machinery Electives (*minimum of 8 credits*)**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | AGE 504 | Agricultural Power | 2 | Elective |
| 2 | AGE 506 | Agricultural Machinery | 2 | Elective |
| 3 | AGE 508 | Design of Agricultural Machines | 2 | Elective |
| 4 | AGE 510 | Farm Transportation | 2 | Elective |

| | | | | |
|---|---|---|---|---|
| 5 | AGE 512 | Operations and Management of Farm Power and Machinery Systems | 2 | Elective |
| 6 | AGE 514 | Mechanics of Deformable Bodies | 2 | Elective |
| 7 | AGE 516 | Automotive Service and Maintenance | 2 | Elective |
| 8 | AGE 518 | Renewable Energy | 2 | Elective |
| 9 | AGE 520 | Industrial Studies | 2 | Elective |
| | | **Total** | **18** | |

**Soil and Water Electives (***minimum of 8 credits***)**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | AGE 522 | Irrigation | 3 | Elective |
| 2 | AGE 524 | Agricultural Land Drainage | 2 | Elective |
| 3 | AGE 526 | Advanced Hydraulics | 3 | Elective |
| 4 | AGE 528 | Rural Water Supply and Sanitation | 2 | Elective |
| 5 | AGE 530 | Design of Irrigation and Soil Conservation Structures | 3 | Elective |
| 6 | AGE 532 | Foundation Engineering | 3 | Elective |
| 7 | AGE 534 | Basic Aquacultural Technology | 3 | Elective |
| 8 | AGE 520 | Industrial Studies | 2 | Elective |
| | | **Total** | **18** | |

**Processing and Storage (Post harvest Technology) Electives (***minimum of 8 credits***)**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | AGE 536 | Advanced Thermodynamics (Heat and Mass Transfer) | 3 | Elective |
| 2 | AGE 538 | Engineering Properties and Handling of Agricultural Materials | 3 | Elective |
| 3 | AGE 540 | Processing and Storage of Agricultural Products (Materials) | 3 | Elective |
| 4 | AGE 542 | Solar Energy Applications for Processing and Storage | 2 | Elective |
| 5 | AGE 544 | Bioprocess Engineering | 3 | Elective |
| 6 | AGE 546 | Fundamentals of Food Engineering I | 3 | Elective |
| 7 | AGE 520 | Industrial Studies | 2 | Elective |
| | | **Total** | **18** | |

**Farm Structures and Environmental Control Electives (***minimum of 8 credits***)**

| S/N | Course Code | Course Title | Credits | Status |
|---|---|---|---|---|
| 1 | AGE 532 | Foundation Engineering | 3 | Elective |
| 2 | AGE 534 | Basic Aquacultural Technology | 3 | Elective |
| 3 | AGE 520 | Industrial Studies | 2 | Elective |
| 4 | AGE 548 | Design of Structures for Biomaterials Storage | 3 | Elective |

| | | | | |
|---|---|---|---|---|
| | | and Livestock Housing | | |
| 5 | AGE 550 | Solid Waste Engineering and Air Pollution | 2 | Elective |
| 6 | AGE 552 | Public Health Engineering | 3 | Elective |
| | | **Total** | **18** | |

## 2.2 Course content

## 2.3 100-Level First Semester

Students take most of these courses from the Faculty of Pure and Applied Sciences, the General Studies and Entrepreneurial Unit, where they already exist in the university.

**CHM101: General Chemistry I (3 Credits: LH 45)**

Atoms, molecules 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.

**CHM107: Practical Chemistry I (1 Credit: PH 45)**

Laboratory experiments designed to reflect the topics taught in CHM 101 such as qualitative and quantitative chemical analyses, acid-base titrations. Gravimetric analysis. Calculation, data analysis and presentation. Functional group analysis.

**MTH101: General Mathematics (Algebra and Trigonometry) (3 Credits: LH 45**

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 rgand diagram. De-Moiré's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

**MTH103: Elementary Vectors, Geometry and Mechanics (3 Credits: LH 45)**

Geometric representation of vectors in 1 -3 dimensions, components and direction cosines. Addition and scalar multiplication of vectors and linear independence. Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two dimensional coordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola, tangent and normal. Kinematics of a particle. Components of velocity and acceleration of a particle moving in a plane. Force, momentum, law of motion under gravity, projectiles and resisted vertical motion. Elastic string and simple pendulum. Impulse, impact of two smooth spheres and asphere on a smooth surface.

**PHY101: General Physics I (Mechanics, Thermal Physics and Waves)(3 Credits: LH 45)**
Space and Time, Units and Dimension, Kinematics; Fundamental Laws of Mechanics, statics and dynamics; work and energy; Conservation laws. Moments and energy of rotation; simple harmonic motion; motion of simple systems; Elasticity; Hooke's law, Young's shear and bulk moduli, Hydrostatics; Pressure; buoyance, Archimedes' Principles; Surface tension; adhesion, cohesion, capillarity, drops and bubbles; Temperature; heat; gas laws; laws of thermodynamics; kinetic theory of gases; Sound. Types and properties of waves as applied to sound and light energies. Superposition of waves. Propagation of sound in gases, solids and liquids and their properties. The unified spectra analysis of waves. Applications.

**PHY103: Heat, Sound and Optics (3 Credits: LH 45)**
Temperature, thermometer, heat transfer and PVT surfaces, Kinetic theory, first and second laws of Thermodynamics. Transverse and longitudinal waves and standing waves. Intensity, beats and Doppler effect. Electromagnetic spectrum. Huygen's principle. Images formed by a single surface, thin lenses and aberrations. The eye, optical instrument, interference, single slit diffraction grating and polarization. Malus's law.

**PHY107: Practical Physics I (1 Credit: PH 45)**
At least six experiments from the following: use of measuring instruments, viscosity, surface tension, oscillation about an equilibrium position, Hooke's law, moment of inertia, focal length of lenses, refractive index, optical instruments, the sonometer, heat capacity, volume expansion

and latent heat. potential difference and internal resistance of cells, use of potentiometer circuit; the metre bridge, simple current measuring instruments. Planck's constants and radioactivity.

**CSC101: Introduction to Computer Science (3 Credits; LH 45)**

History of computers. Computer application in commercial and scientific environments, characteristics of computers, classification and types of computers, computer structure and its components. Introduction to software. Input/output peripheral devices, their advantages and disadvantages. Programming and information presentation. Basic instruction in computer, control programs. Transfer of control. Direct and indirect addressing. Instruction format. Translators, Loaders. Program compilation and execution; syntactic and lexical analysis.

**GEN101: Introduction to Engineering Statistics (2 Credits: LH 30)**

Statistical Data: their sources, collection and preliminary analysis by tables and graphs. Skewness and Kurtosis. Measure of central tendencies: Mean, weighted mean, standard deviation, mode, median and variance (grouped and ungrouped data). Time series and demographic measures and index numbers. Construction of questionnaires and simple index numbers. Use of random numbers and statistical tables. Inference: Estimation and test of hypothesis. Analysis and presentation of data. Curve fitting and goodness-of-fit tests. Regression and correlation of data (an introduction).

**GST101**: **Communication in English I (2 Credits: LH 30)**

Effective communication and writing in English Language skills, essay writing skills (organization and logical presentation of ideas, grammar and style), comprehension, sentence construction, outlines and paragraphs.

**GST107**: **Use of Library, Study Skills and ICT (2 Credits: LH 30)**

Brief history of libraries; Library and education; University libraries and other types of libraries; Study skills (reference services); Types of library materials, using library resources including e-learning, e-materials, etc.; Understanding library catalogues (card, OPAC, etc.) and classification; Copyright and its implications; Database resources; Bibliographic citations and referencing. Development of modern ICT; Hardware technology; Software technology; Input

devices; Storage devices; Output devices; Communication and internet services; Word processing skills (typing, etc.).

### 2.4 100-Level Second Semester

**CHM102: Organic Chemistry (2 Credits)**

Historical survey of the development and importance of organic chemistry; nomenclature and classes of organic compounds, Homologous series; Alkanes, and cycloalkanes, alkenes, alkynes; Functional groups; Benzene and aromacity; isolation, purification and identification of organic compounds.

**CHM104: Inorganic Chemistry (2 Credits: LH 30)**

Units and measurement in physical chemistry. State of matter and change of state; Gases and their properties. Chemical equilibria; Thermochemistry; Introductory chemical kinetics; Acids, bases and salts; Redox reactions and redox potentials

**CHM108: Practical Chemistry II (1 Credit: PH 45)**

Laboratory experiments designed to reflect the topics taught in CHM 102.

**MTH102: General Mathematics II (Calculus) (3 Credits: LH 45)**

Functions of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation, maxima and minima. Extreme curve sketching, integration, definite integrals, reduction formulae, application to areas, volumes (including approximate integration: Trapezium and Simpson's rule).

**PHY102: Electricity and Magnetism (3 Credits: LH 45)**

Coulomb's law. Gauss's theorem. Capacitors. Ohm's law. Kirchoff's laws, electrical energy, D.C. bridges and potentiometer. Magnetic effect of current, electromagnetic induction, moving coil and ballistic galvanometer. Multimeter, D. C. And A. C. Meters and generators. Hysteresis. Power in A. C. circuit, semiconductors, conductivity and mobility. Rectification.

**GST102**: **Communication in English II (2 Credits: LH 30)**

Logical presentation of papers; Phonetics; Instruction on lexis; Art of public speaking and oral communication; Figures of speech; Précis; Report writing.

**GST108: Communication in French (2 Credits: LH 30)**

Introduction to French, Alphabets and numeracy for effective communication (written and oral), Conjugation and simple sentence construction based on communication approach, Sentence construction, Comprehension and reading of simple texts.

**GST110: Basic Communication in Arabic (2 Credits: LH 30)**

Introduction to Arabic alphabets and writing systems. Elementary conversational drills. Basic reading skills and sentence construction in Arabic.

**CSC104 Computer Programming I (2 Credits: LH 30; PH 45)**

Introduction to computers and computing. Problems solving on computer algorithm, design using flowchart and pseudo-code. Introduction to high level programming languages, Basic and FORTRAN syntax, flow of control, input/output constructs, data types. Programming in FORTRAN. Extensive exercises in solving engineering problems using flowchart and pseudo-code.

## 2.5 200-Level First Semester

**CIE203: Strength of Materials (3 Credits: LH 45)**

Consideration of equilibrium; composite members, stress-strain relation. Generalized Hooke's law. Stresses and strains due to loading and temperature changes. Torsion of circular members. Shear force, bending moments and bending stresses in beams with symmetrical and combined loadings. Stress and strain transformation equations and Mohr’s circle. Elastic buckling of columns.

**EEE203: Applied Electricity (2 Credits: LH 30)**

Fundamental concepts - Electric fields, charges, magnetic fields. current, B - H curves Kirchhoff’s laws, superposition. Thevenin, Norton theorems, Reciprocity, RL, RC, RLC circuits. DC, AC bridges, Resistance, Capacitance, Inductance measurement, Transducers, Single phase circuits, Complex J - notion, AC circuits, impedance, admittance, susceptance.

**EMA201: Engineering Mathematics I (3 Credits: LH 45)**

Limits, Continuity, differentiation, introduction to linear first order differential equations, partial and total derivatives, composite functions, matrices and determinants, Vector algebra, Vector calculus, Directional Derivatives.

**GEN201: Engineer in Society (2 Credits: LH 30)**

Philosophy of Science and Engineering. History of Engineering and Technology. The Engineering profession – Engineering literacy professional bodies and engineering societies. Engineers' code of conduct and ethics. Engineers and nation building - economy, politics, business, safety in Engineering and introduction in Risk analysis, invited lecturers from professionals.

**GEN203: Basic Engineering Laboratory I (2 Credits: PH 90)**

Laboratory investigation and report submission for selected experiments and project in Applied Mechanics I, Applied Electricity I, Engineering materials and Strength of materials.

**MEE211: Students Work Shop Experience (1 Credit: PH 45)**

Introduction to practices and skills in general engineering through instruction in operation of hand and powered tools for wood and metal cutting and fabrication. Supervised hands - on experience in safe usage of tools and machines for selected tasks.

**MEE205: Applied Mechanics I (3 Credits: LH 45)**

Forces, moments, couples. Equilibrium of simple structures and machine parts. Friction. First and second moments of area; centroids. Kinematics of particles and rigid bodies in plane motion. Newton's laws of motion. Kinetic energy and momentum analyses.

**MEE207**: **Engineering Materials (3 Credits: LH 45)**

Introduction to electronic configuration, atomic structures, inter-atomic bonding mechanisms, crystal and microstructure. Relationships between structure and properties of metals, alloys,

ceramics and plastics. Principles of the behaviour of materials in common environments. Fabrication processes and applications.

**MEE209: Engineering Drawing I (2 Credits: LH 15; PH 45)**

Transfer of lettering, dimensioning, orthographic projection, auxiliary and mechanical sectional view, true lengths, graphical calculus and architectural drawings.

**GST 201**: **Logic, Philosophy and Human Existence (2 Credits: LH 30)**

A brief survey of the main branches of Philosophy; Symbolic logic; Special symbols in symbolic logic-conjunction, negation, affirmation, disjunction, equivalent and conditional statements, law of tort. The method of deduction using rules of inference and bi-conditionals, qualification theory. Types of discourse, nature or arguments, validity and soundness, techniques for evaluating arguments, distinction between inductive and deductive inferences; etc. (Illustrations will be taken from familiar texts, including literature materials, novels, law reports and newspaper publications).

**GST 203**: **Nigerian Peoples and Culture (2 Credits: LH 30)**

Study of Nigerian history, culture and arts in pre-colonial times; Nigerian's perception of his world; Culture areas of Nigeria and their characteristics; Evolution of Nigeria as a political unit; Indigene/settler phenomenon; Concepts of trade; Economic self-reliance; Social justice; Individual and national development; Norms and values; Negative attitudes and conducts (cultism and related vices); e-orientation of moral; Environmental problems.

## 2.6 200-Level Second Semester

**EEE202: Applied Electricity II (2 Credits: LH 30)**

Basic machines - DC, synchronous alternators, transformers, equivalent circuits. Three phase balanced circuits, PN junction Diode, Transistors, Thyristors FETs, Zener, Rectifiers. Basic control systems, open/closed loop systems. Communications fundamentals, introduction of TV, Radio, Telephone systems.

**EMA202: Engineering Mathematics II (3 Credits: LH 45)**

Second order differential equations, line integral, multiple integral and their applications, differentiation of integral. Analytical functions of complex variables. Transformation and mapping. special functions.

**MEE212: Engineering Drawing II (2 Credits: LH 15; PH 45)**

Advanced topics in auxiliary and sectional views, development, and intersection of surfaces, isometric projection, dimensioning and tolerances. Introduction to computer aided graphics. Blue-print reading.

**MEE214: Fundamentals of Fluid Mechanics (3 Credits: LH 45)**

Properties of fluids, Fluids statics, Basic conservation laws, friction effects and losses in laminar and turbulent flows in ducts and pipes. Dimensional analysis and dynamic similitude, principles of construction and operation of selected hydraulic machinery. Hydropower systems.

**MEE216: Applied Mechanics II (2 Credits: LH 30)**

Hooke's law: stresses and strain due to loading and temperature changes. Torsion. Stress circle. Deflection of beams with symmetrical and combined loadings. Elastic buckling of columns. Shear forces and bendimg moments. Analytical methods for structures.

**MEE218: Engineering Thermodynamics I (3 Credits: LH 45)**

Basic concepts, quantitative relations of Zeroth, first, second and third laws of thermodynamics. Behaviour of pure substances and perfect gases. Ideal gas cycles. Enthalpy concept

**GEN 204: Basic Engineering Laboratory II (2 Credits: PH 90)**

Laboratory investigation and report submission for selected experiments and project in Fundamentals of Thermodynamics, Applied Mechanics II, Applied Electricity II and Fundamentals of fluid mechanics.

**AGE 200: Students Industrial Work Experience (2 Credits: 8 weeks)**

On the job experience in industry chosen for practical working experience but not necessarily limited to the student’s major (8 weeks during the long vacation following 200 level).

**AGE202: Agricultural Engineering Concept ? (1 Credit: LH 15)**

Philosophy, evolution, and ramification of Agricultural Engineering. Expected roles of Agricultural Engineers in power and Machinery; Soil and Water; Processing and Storage; and farm Structures and Environment. Agricultural Engineering vis-a-vis other engineering fields.

**GST 204: History and Philosophy of Science (2 Credits: LH 30)**

Man – his origin and nature, Man and his cosmic environment, Scientific methodology, Science and technology in the society and service of man, Renewable and non-renewable resources – man and his energy resources, Environmental effects of chemical plastics, Textiles, Wastes and other material, Chemical and radiochemical hazards, Introduction to the various areas of science and technology. Elements of environmental studies.

**GST 206 Peace and Conflict resolution (2 Credits: LH 30)**

Basic Concepts in peace studies and conflict resolution; Peace as vehicle of unity and development; Conflict issues; Types of conflict, e. g. Ethnic/religious/political/ economic conflicts; Root causes of conflicts and violence in Africa; Indigene/settler phenomenon; Peace – building; Management of conflict and security. Elements of peace studies and conflict resolution; Developing a culture of peace; Peace mediation and peace-keeping; Alternative Dispute Resolution (ADR). Dialogue/arbitration in conflict resolution; Role of international organizations in conflict resolution, e.g. ECOWAS, African Union, United Nations, etc.

**2.7 300 level first semester**

**AGE 301: Basic Agric. & Bio-Resources Engineering (2 Credits: LH 30)**

Introduction to Agricultural & Bio-Resources engineering profession. Agricultural and Bio-Resources. Identification of various tractors. Identification of other farm power sources. Types of farm implements. Tractor driving and test. Use of tractor for various field operations.

**AGE 303: Hydrology (3 Credits: LH 45)**

Hydrologic cycle, Solar and earth radiation, Precipitation, Evapotranspiration, Infiltration, Rainfall-runoff over agricultural land, Stream gauging, Hydrographs, Streamflow routing, Groundwater hydraulics, Watershed management, Flood control.

**AGE 305: Hydraulics (2 Credits: LH 30)**

Fluid properties. Fluid statics. Fluid motion: continuity, Bernoulli, energy, momentum equations. Reynolds number. Laminar and turbulent flows. Pipe flow. Open channel flow. Weirs, flumes, pumps, turbines, outlets, gates, valves.

**AGE 307: Agricultural Engineering Laboratory Practical I (2 Credits: PH 90)**

The Laboratory practical covers topics in some 300 level courses taken in the first semester.

**CIE 301: Land Surveying (3 Credits: LH 45)**

Definitions, Measurement of distances, Use of minor instruments, Random errors. Chain surveying. Bearing of lines, Levelling, Topographic surveys, Traversing, Theodolite traversing, Plane table surveying, Triangulation, Land shaping and earthwork.

**CIE 303: Soil Mechanics (2 Credits: LH 30)**

Phase relationships, shear strength, consolidation, settlement, compaction. Machinery-soil-relationships, site investigations.

**MEE 301: Mechanics of Machines (2 Credits: LH 30)**

Force and motion relationships in constrained mechanisms. Analysis of car, gear, linkage, belt drive and chain drive systems for motion and power transmission. Vehicular mechanics: brake and clutch systems. Kinetics of rotating and reciprocating masses. Elements of vibratory systems.

**SSL 301: Soil Pedology and Physics (2 Credits: LH 30)**

Origin and formation of soils. Physical properties of soils. Soil colloids; soil reaction; soil mineralogy. Soil organic matter. Soil survey and classification. Water movement in soils.

**EMA 301: Engineering Mathematics III (3 Credits: LH 45)**

Numerical analysis and its application to engineering problems. Operational methods, transform, series and special functions in engineering.

## 2.8 300 level second semester

**AGE 302: Machine Drawing and Design (2 Credits: LH 30)**

Part assembly, Detailed drawing of machine components, Sketching and use of standards: design features, symbols, screws, fasteners, couplings, clutches, gears, Machine component design, Presentation of design portfolio.

**AGE 308: Agricultural Laboratory Practical II (2 Credits: PH 90)**

The Laboratory practical covers topics in some 300 level courses taken in the second semester.

**CIE 302: Geology for Engineers (2 Credits: LH 30)**

The earth, Geological processes, Engineering properties of rocks, Stratigraphy, Geotechnics, Geomorphology, Mineralogy and Petrology, Geology of Nigeria.

**MEE 302: Metallurgy (2 Credits: LH 30)**

Metals and alloys, their production and use. Nature, origin and control of structure in metallic systems and their relation to mechanical properties. Diffusion, deformation, hardening, transformation. Heat treatment. Metal lographic laboratory practice.

**EMA 302: Engineering Mathematics IV (3 Credits: LH 45)**

Mathematical modelling of physical systems, numerical techniques, boundary value problems, Fourier integral, Fourier series, orthogonal functions and Sturm-Liouville systems. Partial differential equations including theory, classification and solution by various methods

**GEN 301: Engineering Statistics (3 Credits: LH 45)**

Descriptive statistics, frequency distribution, populations and sample, central tendency, variance data sampling, mean, median, mode, mean deviation, percentiles etc. Probability. Binomial, poison hyper- geometric, normal distributions, etc. Statistical inference intervals, tests hypothesis and significance. Regression and correlation.

**GEN 302: Engineering Communication (2 Credits: LH 30)**

Principles of effective communication. Professional use of the English language. Principles of technical writing. Oral presentation of technical ideas.

**APH 202: Principles of Animal Production (2 Credits: LH 30)**

Types of livestock (for eggs, milk, meat, wool, etc). Distribution of livestock in Nigeria. Animal feeding and nutrition. Forage crops and their preservation. Artificial insemination. Livestock housing. Livestock processing equipment.

**CPP 202: Principles of Crop Production (2 Credits: LH 30)**

Classification and ecology of crops in Nigeria. Nutrient requirements and mineral nutrition of plants. Manures and fertilizers. Plant growth and development. Growth stages. Tillage and weed control. Other cultural practice. Cropping sequences and rotation. Farming systems. Production practices for specified crops.

## 2.9 400 level first semester

**AGE 401: Farm Power and Machinery (3 Credits: LH 45)**

Farm power sources. Selection and management of farm tractors and equipment. Force analysis and power measurement on tillage tools. Field performance evaluation of crop production equipment. Adjustment, maintenance, and repair of farm tractors and equipment.

**AGE 403: Irrigation and Drainage (3 Credits: LH 45)**

Water requirements in an irrigation system. Methods of irrigation. Frequency and amount of irrigation. Irrigation water scheduling. Evaluating irrigation systems and practices. Design of furrow, basin and sprinkler irrigation. Effect of poor drainage on plants and soils. Drainage requirements of crops, surface drainage. Sub-surface drainage.

**AGE 405: Farm Structures and Environmental Control (3 Credits: LH 45)**

Environmental and structural requirements of crops and livestock, Planning of plant and livestock houses, storage and stores. Design of structural members. Water supply and sewage

disposal. Specifications and selection of farm building materials. Environmental control for plants and livestock. Use of psychrometric charts. Farmstead planning and layout.

**AGE 407: Properties, Handling, Processing and Storage of Agric. Materials(3 Credits: LH 45)**

Properties and characteristics of agric. Materials. Cleaning, sorting and grading. Handling methods. Processing techniques. Crop drying. Crop storage.

**AGE 409: Agricultural Laboratory Practical III (2 Credits: PH 90)**

The Laboratory practical covers topics in some 400 level.

**AGE 411: Farm Management, Rural Sociology and Agric. Extension (2 Credits: LH 30)**

Application of basic sociological concepts to rural life. Management decision making. Functions of Management planning, organisation, staffing, directing and controlling. Financial management. Principles of Extension: diffusion, adoption and rejection of innovations. Communication and leadership in agricultural extension.

**AGE 400: Students' Industrial Work Experience Scheme (SIWES) (6 Credits)**

Practices and skills in Agricultural engineering through instruction in operation of machines, hand and powered tools. Students will be in industry for the period of six months and are expected at the end of the period to present seminar on industrial training experience.

**GEN 401: Economics for Engineers (2 Credits; LH 30)**

Economic analysis of engineering projects; value systems economic decisions on capital investments and choice of engineering alternatives; new projects, replacement and abandonment policies, risky decisions; corporate financial practices.

**2.10 500 Level First Semester**

**AGE 501: Seminar**

Review of scientific literature

**AGE 503: Farm Electrification (3 Credits: LH 45)**

Electrical codes, tariffs and regulations. Generation and transmission of electricity,
Farmstead distribution systems. Testing procedure. Power factor correction. Selection and use of electric motors. Transformers. Energy conversion. Application of electricity to handling, processing and storage of agricultural products. Basic electronic applications to farm electrical processes.

**AGE 505: Soil and Water Conservation (3 Credits: LH 45)**

Types of erosion, Soil erosion by water, Universal soil loss equation. Control of soil erosion by water. Wind erosion and its control, Desertification and control measures. Earth dams and farm ponds.

**AGE 507: Land Clearing and Development (2 Credits: LH 30)**

Land resources and Land Use Act in relation to Nigerian agriculture. Objectives, methods and equipment for land clearing and development. Machinery selection, mechanics of operation and vegetation types. Land reclamation. Earthmoving machinery and earthmoving mechanics.

**AGE 509: Agricultural Mechanisation (2 Credits: LH 30)**

Nature and objectives of agricultural mechanisation. Factors affecting agricultural mechanisation in the tropics. Analysis of production systems. Agricultural mechanisation as a strategy for rural development. Impact on food production and on infrastructural development. Linkages with rural industrialisation. Case studies of selected farms.

**AGE 597 and 598: Final Year Project (6 Credits: PH 270)**

Individual student project to deepen knowledge, strengthen practical experience and encourage creativity and independent work. The project ends in a comprehensive written report.

### 2.11 500 Level Second Semester

**AGE 502:Environmental Engineering (3 Credits: LH 45)**

Design of unit operations and processes in water and wastewater treatment. Sedimentation. Chemical coagulation. Ion exchange. Filtration. Disinfection. Water supply treatment and

distribution. Water quality. Wastewater handling, treatment and disposal. Solid waste disposal. Air pollution and control. Noise pollution control, contaminated soil remediation.

**AGE 504: Agricultural Power (3 Credits: LH 45)**

Farm power sources, Farm tractor; selection, use, maintenance, Other power sources; selection, use, maintenance. Hitches and hitch systems, design considerations of single-axle, two-wheel drive, four-wheel drive and crawler tractors, Tractor mechanics. Power Measurement. Fluid controls. Ergonomics. Tractor testing and test codes.

**AGE 506: Agricultural Machinery (3 Credits: LH 45)**

Force analysis and design consideration of various farm machinery. Hitching methods. Power requirement for operating farm equipment and machines. Operation and maintenance of various farm machinery. Field evaluation. Criteria for replacement. Cost analysis of the use of agricultural machines.

**AGE 508: Design of Agricultural Machines (2 Credits: LH 30)**

Machine design processes and procedures. Materials of construction: selection, strength properties, stress analysis, costing. Design of machine elements. Machine fabrication. Typical designs of low cost agricultural machinery. Problems and prospects of agricultural machinery development and commercial manufacture in Nigeria.

**AGE 510: Farm Transportation (2 Credits: LH 30)**

Farm roads. Farm transportation system. Development and construction of farm transport equipment. Farm transport system —standards and specifications. Ergonomics.

**AGE 512: Operation and Management of Farm Power and Machinery Systems (2 Credits: LH 30)**

Integrated approach to machinery usage and agricultural production sequence, Equipment selection, scheduling of operation, seasonality factor, Machinery management, Machinery ownership and financing, Gross margin analysis. Optimisation of machinery — input combinations, Management of farm enterprise, Case studies.

**AGE 514: Mechanics of Deformable Bodies (2 Credits: LH 30)**

Three dimensional stress and strain, Theories of failure, Stress concentration. Moments and products of inertia and area, Mohr's strain and inertia circles. Unsymmetrical bending, shear center, Curved beams.

**AGE 516: Automotive Service and Maintenance (2 Credits: LH 30)**

Service and maintenance of all the components of an automobile.

**AGE 518: Renewable Energy Engineering (2 Credits: LH 30)**

Renewable energy resources: development, utilization and environmental impact assessment. Design of processes and equipment for biomass, biofuel and biogas production. Storage and distribution of biogas for domestic and industrial use.

**AGE 520: Industrial Studies (2 Credits: LH 30)**

Organisational structure of manufacturing organisation. Market survey, Feasibility studies, Project and contract documents. Specification, planning schedule Quality control. Safety and safety procedures.

**AGE 522: Irrigation (3 Credits: LH 45)**

Design of open channels. Water flow measurement. Pumping power requirements. Design of irrigation systems: border, sprinkler, drip, etc. Salinity and quality of irrigation water. Reclamation of saline and alkali soils. Seepage from canals and canal lining. Design of an irrigation project. Evaluating irrigation systems and practices. Irrigation water management.

**AGE 524: Agricultural Land Drainage (2 Credits: LH 30)**

Surface drainage. Subsurface drainage. Design of drainage systems. Envelope materials and their design. Loads on conduits. Drainage pumping. Construction and installation of drains. Maintenance of drains.

**AGE 526: Advanced Hydraulics (3 Credits: LH 45)**

Pipe flow, Pipes in parallel and in series. Branched pipes. Simple pipe network. Water hammer. Hardy Cross method of water distribution. Open channel flow. Channel transition and control. Hydraulic jump. Backwater curves. Dimensional analysis and similitude. Reservoir hydraulics and planning. High pressure outlets, gates, valves.

**AGE 528: Rural Water Supply and Sanitation (2 Credits: LH 30)**

Water requirements. Water quality standards. Water borne diseases. Biochemical oxygen demand. Potable water impurities. Sources and treatment methods of water for rural homes. Water lifting devices. Transportation and distribution systems. Pipe sizes. Waste disposal in rural communities. Collection, conveyance, treatment and disposal of sewage from rural homes. Septic tanks, digestion ponds and family privies.

**AGE 530: Design of Irrigation and Soil Conservation Structures (2 Credits: LH 30)**

Factors affecting efficient farm water management. Review of relevant hydraulic theories. Design of irrigation structures. Design of soil conservation structures.

**AGE 532: Foundation Engineering (3 Credits: LH 45)**

Stress in soils. Consolidation, compaction, CBR and soil improvement, stability of slopes. Earth pressure analysis. Bearing capacity and settlement analysis of shallow and deep foundations. Design of footings, foundations, retaining walls. Analysis and control of groundwater.

**AGE 534: Basic Aquacultural Technology (3 Credits: LH 45)**

Mass balance dynamics including flow through and recirculation. Water mass balances, loading rates and how they affect fish growth and health. Sedimentation, bioinfiltration and gas transfer. Equipment and techniques for ozonization and UV-irradiation. Design of aquacultural buildings and structures. Aquaponics.

**AGE 536: Advanced Thermodynamics (3 Credits: LH 45)**

Thermodynamics of gases, vapours and reactive and non-reactive mixtures. Process relations. Concepts of equilibrium, reversibility.

**AGE 538: Engineering Properties and Handling of Agricultural Materials (3 Credits: LH 45)**

Physical, mechanical, rheological and thermal properties of agricultural materials. Newtonian and Non-Newtonian fluids. Handling methods. Design and construction of appropriate material handling equipment for tropical products. Economics of material handling.

**AGE 540: Processing and Storage of Agricultural Products (3 Credits: LH 45)**

Cleaning, sorting, grading and separation: Principle techniques and machine, communication, Particle size analysis. Heat treatment. Dehydration and drying. Psychrometry, Storage types and environment. Deterioration of produce in storage. Containerisation. Design of grain storage structures. Environmental control in storage

**AGE 542: Solar Energy Applications to Processing and Storage (2 Credits: LH 30)**

Fundamentals of solar radiation. Solar heating and cooling, heat transfer, solar energy conversion efficiency. Principles of solar collectors. Solar heat storage and storage systems for tropical crops.

**AGE 544: Bioprocess Engineering (3 Credits: LH 45)**

Unit operations in food and bioproduct processing. Process measurement, observation and control. Energy and momentum balance as related to process efficiency calculations. Transesterification process. Microbial production systems. Bioreactor design. Engineering systems for product development.

**AGE 546: Fundamentals of Food Engineering I (3 Credits: LH 45)**

Basic methods of food processing: pasteurization, sterilization, dehydration, etc. Techniques, processes and equipment for food preservation: cold storage, smoking, sun-drying, artificial drying and canning. Principles, techniques and machine communication in flour and bread making, brewing and dairy products processing.

**AGE 548: Aquacultural and Animal Production Engineering (3 Credits: LH 45)**

Production and processing techniques for fishes and marine foods. Machines and structures for fishery operations. Design of machines for slaughtering, cutting and packaging of animals.

**AGE 538: Engineering Properties and Handling of Agricultural materials (2 Credits: LH 30)**

Material handling methods and systems. Design and construction of appropriate material handling equipment for agricultural and biological materials. Economics of material hading. Newtonian and non- Newtonian.

**AGE 546: Fundamentals of Food Engineering I (3 Credits: LH 45)**

Development of food preservation practices and equipment. Design of machine and equipment for material separation including distillation, solvent extraction, mechanical extraction, leaching, drying, humidification, evaporation and crystallization. Use of analytical and graphical techniques.

## Course Learning Outcomes (CLOs)

Below is the list of the course learning outcomes (CLOs)

**100 LEVEL FIRST SEMESTER**

**CHM101: General Chemistry I (3 Credits: LH 45)**

**Course Learning Outcomes** (CLOs)

1. Describe the modern electronic theory of atoms, including the arrangement of electrons within an atom, the concept of energy levels, and the organization of the periodic table.
2. Determine electronic configurations for various elements and understand the periodic trends in atomic properties such as size, ionization energy, and electronegativity.
3. Explain the concept of chemical bonding, including covalent and ionic bonding, and predict the shapes of simple molecules through hybridization theory.
4. Explain the concept of balancing chemical equations, perform stoichiometric calculations, and the principles of conservation of mass in chemical reactions.
5. Outline the structure of solids, the types of valence forces that hold them together, and how these forces affect the physical properties of materials.
6. Explain the kinetic theory of matter, rates of chemical reactions, chemical equilibrium, and basic thermodynamic principles, including concepts like entropy and enthalpy.
7. Define acids and bases, calculate pH and pOH, and understand the properties and reactions of acidic and basic substances, including salt formation.
8. Explain redox reactions, oxidation states, and the basics of electrochemistry, including the principles of galvanic cells and electrolysis.

**CHM107: Practical Chemistry I (1 Credit: PH 45)**

**Course Learning Outcomes (CLOs)**

1. Conduct acid-base titrations and determine the end point.
2. Employ gravimetric analysis methods to quantitatively determine the mass of a specific substance in a given sample.
3. Conduct practical on the principles of precipitation and filtration techniques in gravimetric analysis and report the findings.
4. Perform mathematical calculations and data analysis to interpret experimental results effectively.
5. Identify and analyze functional groups in organic compounds through various chemical tests and spectroscopic methods.

**MTH101: General Mathematics (Algebra and Trigonometry) (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Represent set theory, including concepts such as subsets, union, intersection, complements using Venn diagrams.
2. Apply understanding of real numbers, including integers, rational numbers, and irrational numbers, and apply them to various mathematical contexts.
3. Apply mathematical induction to prove mathematical statements, analyze real sequences and series, and understand the theory of quadratic equations and the Binomial theorem.
4. Utilize complex numbers, including their algebraic properties and the use of Argand diagrams, to solve complex mathematical problems.
5. Apply advanced trigonometric concepts, including circular measure, trigonometric functions of angles of any magnitude, and addition and factor formulae, to solve trigonometry-related problems and equations.

**PHY101: General Physics I (Mechanics, Thermal Physics and Waves) (3Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Explain the concept of space and time, units and dimension.
2. Explain the fundamental laws of mechanics, statics, and dynamics; work and energy; conservation laws.
3. Apply kinematic principles to analyse the motion of particles simple harmonic motion; motion of simple systems; Elasticity; Hooke's law.
4. Analyse the heat transfer in a system and its identified dynamic behaviours.
5. Explain the types and properties of waves as applied to sound and light energies. Superposition of waves. Propagation of sound in gases, solids and liquids and their properties. The unified spectra analysis of waves. Applications.

**PHY103: Heat, Sound and Optics (3 Units: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Precisely describe an object’s motion using the fundamental quantities of position, velocity, and acceleration, and use the kinematic equations to predict how this motion will change over time.

2. Determine when objects are in equilibrium by mathematically and diagrammatically adding up the forces on those objects and predict their subsequent motion if they are not in equilibrium.
3. Use conserved quantities like momentum and energy to infer how multi-object systems change over time.
4. Describe periodic (repeating) phenomena using the fundamental quantities of amplitude, frequency, period, and wavelength, and use them to predict how the phenomenon will behave at later times or locations.
5. Apply Newton's laws and conservation principles to continuous, fluid-flow systems to describe their equilibrium conditions in terms of pressure, velocity, and flow rate in both idealized (non-viscous) and viscous fluids.
6. Determine when objects are in equilibrium by mathematically and diagrammatically adding up the forces on those objects and predict their subsequent motion if they are not in equilibrium.

**PHY107: Practical Physics I** **(1 Unit: PH 45)**

**Course Learning Outcomes (CLOs)**

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.

**CSC101: Introduction to Computer Science** **(3 Credits)**

**Course Learning Outcomes (CLOs)**

1. Explain the history of computers and their evolution, highlighting their significant impact on commercial and scientific environments.
2. Describe the characteristics of computers, including their classification and types, and gain an understanding of the structure and components that make up a computer system.
3. Explain the concept of software and its role in computer systems, covering input/output peripheral devices and their advantages and disadvantages.
4. Explain the fundamentals of programming, including basic computer instructions, control programs, addressing modes (direct and indirect), instruction formats, and the role of translators and loaders.

**GEN101: Introduction to Engineering Statistics** **(2 Credits)**

**Course Learning Outcomes (CLOs)**

1. Use statistical methodology and tools in the engineering problem-solving process.
2. Compute and interpret descriptive statistics using numerical and graphical techniques.
3. Solve problems involving basic concepts of probability, random variables, probability distribution and joint probability distribution.

4. Compute point estimation of parameters, explain sampling distributions, and understand the central limit theorem.
5. Construct confidence intervals on parameters for a single sample.

**GST101**: **Communication in English I:** (**2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Identify possible sound patterns in English Language.
2. Classify word formation processes.
3. Construct simple and fairly complex sentences in English.
4. Apply logical and critical reasoning skills for meaningful presentations.
5. Demonstrate an appreciable level of the art of public speaking and listening.
6. Write simple and technical reports.

**GST107**: **Use of Library, Study Skills and ICT** (**2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Discuss the history of libraries; Library and education; University libraries and other types of libraries.
2. List the different types of Study skills (reference services); List the types of library materials, using library resources including e-learning, e-materials and how it can be applied in other aspects of academic research.
3. Outline the types of Library catalogues (card, OPAC, etc.) and classification.
4. Define and discuss copyright and its implications on database resources. Outline the importance of Bibliographic citations and referencing; consequences that may occur, if not done properly.
5. Outline the development of modern ICT. Be able to identify the different parts of Hardware technology; Software technology; Input devices; Storage devices; Output devices as it applies to ICT.
6. Perform practical exercises on communication and internet services; Execute Word processing skills (typing, etc.).

**100-Level Courses Second Semester**

**CHM102: Organic Chemistry (2 Units: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Explain the historical development and significance of organic chemistry as a branch of chemistry, recognizing its role in shaping the modern world.
2. Identify and classify the various nomenclatures of organic compounds based on homologous series concept.
3. Describe the structure and properties of specific organic compound classes, including alkanes, cycloalkanes, alkenes, alkynes, and the significance of functional groups.

4. Analyze the unique characteristics of benzene and its relationship to the concept of aromaticity within organic compounds.
5. Explain the techniques for the isolation, purification, and identification of organic compounds.

**CHM104: Inorganic Chemistry (2 Units: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Explain units and measurements in the context of physical chemistry, including the ability to convert between different units and perform accurate measurements.
2. Analyse the various states of matter and their transitions and apply principles of thermodynamics to explain changes in state, such as phase transitions and phase diagrams.
3. Describe the properties and behaviours of gases, including gas laws, ideal gases, and real gases, and apply this knowledge to practical situations.
4. Evaluate chemical equilibria, including the concept of equilibrium constants, Le Chatelier's principle, and the calculation of equilibrium concentrations.
5. Calculate and analyse thermochemical properties, including enthalpy, entropy, and Gibbs free energy, and apply these concepts to understand energy changes in chemical reactions.
6. Explain the fundamentals of introductory chemical kinetics, including reaction rates, rate laws, and reaction mechanisms, and apply this knowledge to predict reaction rates and mechanisms.
7. Define and characterize acids, bases, and salts, and demonstrate the ability to calculate pH, pOH, and perform titrations.
8. Describe redox reactions, identify oxidation and reduction processes, and calculate redox potentials and half-reactions.

**CHM108: Practical Chemistry II (1 Credit: PH 45)**

**Course Learning Outcomes (CLOs)**

1. List the basic safety rules in the organic chemistry laboratory.
2. Identify and use the common laboratory apparatuses and equipment
3. Apply the basic organic laboratory techniques, carryout experiments and document report for the isolation and purification of organic compounds
4. Carryout experiments and document report for the determination of physical constants of organic compounds
5. Carryout simple experiments illustrating the identities and reactions of organic compounds and report inference.

**MTH102: General Mathematics II (Calculus) (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Solve mathematical questions that involve the different rules in differentiation and integration.
2. Solve questions involving function of a real variable, graphs, limits and continuity.
3. Solve some applications of definite integrals in areas and volumes of solids.
4. Solve questions involving the derivative as limit of rate of change.
5. Perform extreme curve sketching.
6. Solve questions involving integration as an inverse of differentiation.
7. Solve questions involving methods of integration and definite integrals.

**MTH 104: Elementary Vectors, Geometry and Mechanics (3 Units: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Represent vectors geometrically in one to three dimensions and determine their components and direction cosines.
2. Perform vector addition, scalar multiplication, and determining linear independence of vectors.
3. Compute both scalar and vector products of two vectors and apply these concepts in various contexts.
4. Differentiate and integrate vector functions with respect to a scalar variable.
5. Solve problems involving two-dimensional coordinate geometry, including the equations and properties of straight lines, circles, parabolas, ellipses, hyperbolas, tangents, and normal.
6. Analyze the kinematics of particles, calculating the components of velocity and acceleration for particles moving within a plane.
7. Explain the fundamental principles of force, momentum, and the laws of motion under gravity. Able to apply these concepts to analyze projectile motion and resisted vertical motion.
8. Describe the behaviour of elastic strings and simple pendulums, including their oscillatory motion characteristics.
9. Perform calculation on impulse and analyze the impact of two smooth spheres colliding on a smooth surface, considering conservation laws and collision dynamics.

**PHY102: Electricity and Magnetism (3 Units: LH 45)**

**Course Learning Outcomes (CLOs)**

Upon completing the course, the student will be able to:

1. Explain and apply fundamental principles of electromagnetism, including Coulomb's law and Gauss's theorem, to analyze electric fields and their effects on charged particles.
2. Describe electrical circuits, including capacitors, Ohm's law, Kirchhoff's laws, and their application in solving circuit problems.
3. Describe the magnetic effect of current, electromagnetic induction, and the operation of devices such as moving coil and ballistic galvanometers.
4. Utilize electrical measuring instruments, including multimeters, DC and AC meters, and generators, to measure and analyze electrical quantities in circuits.

5. Explain the concepts of power in AC circuits, semiconductor properties such as conductivity and mobility, and the principles of rectification in electrical circuits.

**GST102**: **Communication in English II** **(2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Restate the meaning of an English paragraph after analyzing it
2. Write in English without making any grammatical errors.
3. Pronounce words correctly in the English language.
4. Confidently express your opinions in English.
5. Communicate values and abilities acquired via successful communication to other disciplines.
6. Write English compositions and articles.

**GST108: Communication in French** (**2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Write down the French alphabets.
2. Outline the numeracy for effective communication (written and oral)
3. Construct simple sentences, read comprehension passages and answer questions.

**GST110: Basic Communication in Arabic** (**2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Discuss the values of Arabic Language.
2. Construct simple sentences in Arabic language.
3. Analyse difficult words from both vocalized and unvocalized Arabic texts.
4. Reading Arabic text and answering questions.

**PHY 108: Practical Physics II** **(2 Credits: LH 30; PH 45)**

**Course Learning Outcomes (CLOs)**

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.
6. Prepare and present practical reports.

**CSC104: Computer Programming I** (**2 Credits: LH 30; PH 45)**

**Course Learning Outcomes (CLOs)**

1. Explain the principles of good programming and structured programming concepts.

2. Explain the programming constructs, syntax and semantics of a higher-level language.
3. Describe the chosen programming language variables, types, expressions, statements and assignment, Simple input and output.
4. Describe the programme control structures, functions and parameter passing, and structured decomposition.
5. Develop simple programmes in the taught programming language as well as debug and test them.

**200-LEVEL FIRST SEMESTER**

**CIE203: Strength of Materials (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Recognize a structural system that is stable and in equilibrium;
2. Determine the stress-strain relation for single and composite members based on Hooke's law;
3. Estimate the stresses and strains in single and composite members due to temperature changes;
4. Evaluate the distribution of shear forces and bending moments in beams with distributed and concentrated loads;
5. Determine bending stresses and their use in identifying slopes and deflections in beams;
6. Use Mohr's circle to evaluate the normal and shear stresses in a multi-dimensional stress system and transformation of these stresses into strains;
7. Evaluate the stresses and strains due to torsion on circular members; and
8. Determine the buckling loads of columns under various fixity conditions at the ends.

**EEE203: Applied Electricity (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Demonstrate a strong conceptual understanding of electric and magnetic fields, charges, and their interactions.
2. Analyze complex electrical circuits using Kirchhoff's laws and superposition, effectively solving problems involving both DC and AC circuits.
3. Apply Thevenin's and Norton's theorems to simplify and analyze complex circuits, determining equivalent circuits accurately.
4. Apply the principle of reciprocity to analyze linear passive networks and determine their behavior under different conditions.
5. Design and analyze circuits containing resistors, inductors, capacitors, or combinations (RL, RC, RLC), considering transient and steady-state responses.
6. Accurately measure resistance, capacitance, and inductance using appropriate instruments and techniques.
7. Understand the operation and use of transducers in various engineering applications.
8. key parameters such as voltage, current, power, and energy in single-phase electrical circuits.

9. Utilize complex impedance and j-notation for AC circuit analysis, solving problems involving impedance matching and power factor correction.
10. Analyze and design AC circuits, calculate impedance, admittance, and susceptance, and solve AC circuit problems with proficiency.

**EMA201: Engineering Mathematics I (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Solve qualitative problems based on vector and matrix analyses such as linear independence and dependence of vectors, rank;
2. Describe the concepts of limit theory and nth order differential equations and their applications to physical phenomena;
3. Solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables;
4. Describe the applications of double and triple integration in finding the area and volume of engineering solids, and explain the qualitative applications of Gauss, Stoke's and Green's theorem;
5. Explain ordinary differential equations and applications, and develop a mathematical model of linear differential equations, as well as appreciate the necessary and sufficient conditions for total differential equations; and
6. Analyze basic engineering models through partial differential equations such as wave equation, heat conduction equation, etc., as well as fourier series, initial conditions and its applications to different engineering processes

**GEN201: Engineer in Society (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Differentiate between science, engineering and technology, and relate them to innovation;
2. Distinguish between the different cadres of engineering – engineers, technologists, technicians and craftsmen and their respective roles and competencies;
3. Identify and distinguish between the relevant professional bodies in engineering;
4. Categorize the goals of global development or sustainable development goals (SDGs); and
5. Identify and evaluate safety and risk in engineering practice.

**GEN203: Basic Engineering Laboratory I (2 Credits: PH 90)**

**Course Learning Outcomes (CLOs)**

1. Identify various basic hands and machine tools, analogue and digital measurement devices and instruments, and acquire skills in their effective use and maintenance;
2. Practically apply basic engineering technologies, including metrology, casting, metal forming and joining, materials removal, machine tooling (classification, cutting tool action, cutting forces, non-cutting production) and CNC machining technology;
3. Master workshop and industrial safety practices, accident prevention and ergonomics;
4. Physically recognize different electrical & electronic components like resistances, inductances, capacitances, diodes, transistors and their ratings;

5. Connect electric circuits, understand different wiring schemes, and check ratings of common household electrical appliances and their basic maintenance; and
6. Determine household and industrial energy consumption, and understand practical energy conservation measures.

**MEE211: Students Work Shop Experience (1 Credit: PH 45)**

**Course Learning Outcomes**: **(CLOs)**

1. Recognize and describe a variety of hand and powered tools commonly used in woodworking and metalworking.
2. Demonstrate a commitment to safety by consistently following safe practices when working with tools and machinery.
3. Exhibit competence in operating selected tools and machinery, showcasing proper techniques and precision in their use.
4. Choose the appropriate tools for specific engineering tasks, taking into consideration factors such as material type, project requirements, and safety.
5. Execute woodworking tasks, including accurate measurement, cutting, shaping, and assembly of wood components.
6. Execute metalworking tasks, such as cutting, grinding, drilling, and shaping metal materials with precision.
7. Apply engineering problem-solving techniques to troubleshoot issues and determine optimal solutions when working on engineering tasks.

**MEE205: Applied Mechanics I (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Identify and differentiate various types of forces, moments, and couples encountered in engineering systems, and analyze their effects.
2. Analyze the equilibrium of simple structures and machine components subjected to diverse external loads.
3. Demonstrate an understanding of the principles of friction and calculate frictional forces in engineering applications.
4. Evaluate first and second moments of area for plane figures and determine centroids to analyze their structural characteristics.
5. Apply kinematic principles to analyze the motion of particles and rigid bodies in plane motion.
6. Perform kinetic energy analyses for engineering systems in motion to determine their energy states.
7. Calculate momentum for particles and rigid bodies during motion to analyze their dynamic behavior.

**MEE207**: **Engineering Materials (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Describe electronic configurations and atomic structures, emphasizing their influence on material behavior and properties. Analyze bonding mechanisms and crystal structures in diverse materials to comprehend their unique properties.
2. Relate microstructure to material properties, examining how material processing affects the final product.
3. Compare the properties and performance of metals, alloys, ceramics, and plastics in various environments.
4. Demonstrate an understanding of the relationships between material structure and properties.
5. Explore fabrication processes used to produce materials, such as casting, welding, and molding.
6. Apply knowledge of material properties to select suitable materials for specific engineering applications.
7. Evaluate the applications and limitations of different materials in engineering and technology.

**MEE209: Engineering Drawing I (2 Credits: LH 15; PH 45)**
**Course Learning Outcomes (CLOs)**

1. Transfer lettering accurately onto technical drawings, ensuring legibility and consistency in style and size.
2. Dimension technical drawings correctly, using appropriate symbols and practices, to convey size and tolerances effectively.
3. Create comprehensive orthographic projection views of 3D objects, enabling clear and precise visualization of object geometry.
4. Develop the ability to construct auxiliary and sectional views to represent complex features and internal structures of objects with accuracy.
5. Accurately calculate and represent the true lengths of lines and edges in different views, considering projection effects.
6. Utilize graphical calculus techniques to solve engineering and geometric problems related to curves and surfaces in technical drawings.
7. Create architectural drawings that conform to industry standards, including floor plans, elevations, and sections, for architectural design and construction purposes.

**GST 201**: **Logic, Philosophy and Human Existence (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**
At the end of the course, 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 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.

**GST 203**: **Nigerian Peoples and Culture** **(2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Analyze 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. Analyze the concepts of trade, economic and self-reliance status of the Nigerian people towards national development;
5. Enumerate the challenges of the Nigerian State towards nation building;
6. Analyze 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.

**200-Level Second Semester**

**EEE202: Applied Electricity II** **(2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Analyze and describe the operating principles of DC machines, synchronous alternators, and transformers, and calculate their equivalent circuit parameters.
2. Solve problems related to three-phase balanced circuits, including calculations of power, voltage, and current in balanced loads.
3. Demonstrate competence in working with semiconductor devices such as PN junction diodes, transistors, thyristors, FETs, and Zener diodes, including their applications in circuits.
4. Apply knowledge of basic control systems to design open-loop and closed-loop control systems for simple engineering applications.
5. Explain the fundamental principles of TV, radio, and telephone systems, and understand their role in modern communication technology.

**EMA202: Engineering Mathematics II** **(3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Describe physical systems using ordinary differential equations (ODEs);
2. Explain the practical importance of solving ODEs, solution methods, and analytically solve a wide range of ODEs, including linear constant coefficient types;
3. Numerically solve differential equations using MATLAB and other emerging applications;
4. Perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion, as well as on functions of several variables, including directional derivatives and multiple integrals;
5. Solve problems using the fundamental theorem of line integrals, Green's theorem, the divergence theorem, and Stokes' theorem, and perform operations with complex numbers;

6. Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions of complex variables, as well as the theory of conformal mapping to solve problems from various fields of engineering; and
7. Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula.

**MEE212: Engineering Drawing II (2 Credits: LH 15; PH 45)**

**Course Learning Outcomes (CLOs)**

1. Demonstrate the ability to create advanced auxiliary and sectional views that accurately depict complex features and internal structures in engineering drawings.
2. Apply intersection development techniques proficiently to visualize the blending and intersection of multiple surfaces in three-dimensional objects.
3. Display proficiency in isometric projection methods, representing objects with clarity and realistic perspectives.
4. Employ dimensioning and tolerance practices effectively to ensure the precise manufacturing and assembly of engineering components.
5. Attain proficiency in using computer-aided graphics software for engineering design and visualization.
6. Interpret and analyze blueprints adeptly to understand the intended design and specifications of engineering projects.
7. Demonstrate a comprehensive understanding of blueprint reading and its practical application in engineering projects.

**MEE214: Fundamentals of Fluid Mechanics (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Demonstrate an understanding of fluid properties, such as viscosity, density, and surface tension, and their influence on fluid behavior. Calculate pressure distributions and buoyant forces in diverse fluid systems, analyzing fluid statics problems.
2. Apply the principles of continuity, momentum, and energy equations to effectively solve fluid flow problems in both steady and unsteady states.
3. Differentiate between laminar and turbulent flows, and analyze friction losses in ducts and pipes using practical examples.
4. Utilize dimensional analysis to obtain dimensionless groups and apply them to fluid flow modeling.
5. Exhibit knowledge of the construction and operation principles of hydraulic machinery, including pumps and turbines.
6. Apply acquired knowledge of hydropower systems to design and assess the performance of water turbines in renewable energy generation.
7. Compare the efficiency and performance characteristics of different hydraulic machines under varying operating conditions.

**MEE216: Applied Mechanics II (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Apply Hooke's law to analyze the behavior of materials under various types of loading, including tension, compression, and thermal expansion.
2. Analyze and predict the torsional behavior of materials and structures subjected to torsion loads, determining the resulting stresses and strains.
3. Calculate and interpret stress circles to analyze principal stresses and their orientations in different loading scenarios.
4. Calculate and predict the deflections of beams under different loading conditions, including symmetrical and combined loadings, and assess their impact on structural integrity.
5. Design structural components to resist elastic buckling, taking into account factors such as material properties and geometric configurations.
6. Determine shear forces and bending moments in structures and assess their effects on structural stability and safety.
7. Apply various analytical methods to solve real-world structural engineering problems, demonstrating the ability to use mathematical techniques to find solutions.

**MEE218: Engineering Thermodynamics I (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Demonstrate a clear understanding of the fundamental concepts of thermodynamics, such as energy, heat, and work, within engineering contexts.
2. Apply the quantitative relations of the zeroth, first, second, and third laws of thermodynamics effectively to solve engineering problems.
3. Analyze the behavior of pure substances and perfect gases using thermodynamic properties, including temperature, pressure, and volume.
4. Evaluate the efficiency and performance of ideal gas cycles, identifying their applications in various engineering processes.
5. Exhibit a comprehensive understanding of the concept of enthalpy and its crucial role in energy calculations.
6. Interpret thermodynamic data and properties from tables and charts proficiently for practical engineering calculations.
7. Compare the characteristics of different ideal gas cycles, such as the otto cycle and the rankine cycle, in a range of engineering applications.

**GEN 204: Basic Engineering Laboratory II (2 Credits: PH 90)**

**Course Learning Outcomes (CLOs)**

1. Independently set up and conduct experiments in the areas of thermodynamics, mechanics, electricity, and fluid mechanics.

2. Apply theoretical concepts from Fundamentals of Thermodynamics, Applied Mechanics II, Applied Electricity II, and Fundamentals of Fluid Mechanics to experimental situations.
3. Collect, organize, and analyze experimental data using appropriate statistical and analytical methods.
4. Identify and resolve issues or discrepancies in experimental results, demonstrating problem-solving skills.
5. Adhere to laboratory safety protocols, minimizing risks and ensuring the safety of oneself and others.
6. Create experimental setups, including selecting appropriate instruments and methods, to address specific research questions.
7. Write clear, concise, and well-organized laboratory reports that include objectives, methods, results, discussion, and conclusions.
8. Present findings from experiments and projects effectively, using visual aids and verbal communication to convey key points.
9. Collaborate with team members effectively, demonstrating the ability to work cooperatively towards common goals.

**AGE 200 Students Industrial Work Experience (2 Credits: 8 weeks)**

**Course Learning Outcomes (CLOs)**

1. Anticipate in an industry-specific practical working experience aligned with personal interests and career aspirations.
2. Utilize theoretical knowledge acquired during academic studies to address real-world challenges and tasks in the workplace.
3. Cultivate essential skills and competencies beyond the major, fostering adaptability and versatility in diverse work environments.
4. Exhibit professionalism, punctuality, and effective communication in a professional work setting.
5. Acquire exposure to various aspects of the industry and engage with day-to-day operations.
6. Engage in reflective practices to identify areas for personal and professional growth during the practical working experience.
7. Produce a comprehensive report or presentation showcasing the learnings, experiences, and accomplishments throughout the program.

**AGE202: Agricultural Engineering Concept (1 Credit: LH 15)**
**Course Learning Outcomes (CLOs)**

1. Analyze the historical development of agricultural engineering and its evolution from traditional farming practices to modern agricultural technology.
2. Assess the impact of agricultural engineering on agricultural productivity, sustainability, and food security, and its role in addressing global agricultural challenges.

3. Demonstrate the ability to apply engineering principles in the selection, design, and maintenance of agricultural machinery and equipment.
4. Apply soil and water management techniques, including irrigation and drainage systems, to enhance soil fertility and water use efficiency.
5. Design and manage facilities for the processing, handling, and storage of agricultural products, ensuring product quality and safety.
6. Plan and design farm structures and environmental control systems, considering factors like climate, ventilation, and animal welfare.
7. Differentiate agricultural engineering from other engineering disciplines, recognizing its specific focus on agriculture-related challenges and solutions.

**GST 204: History and Philosophy of Science (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Gain an understanding of theories and concepts related to the origin and nature of human beings and their interconnectedness with the natural world.
2. Study the interactions between humanity and the broader cosmic environment, including celestial bodies and natural phenomena, to appreciate the interconnectedness of Earth with the cosmos.
3. Acquire knowledge of the scientific method and how it is applied to investigate and understand the natural world, fostering critical thinking and research skills.
4. Explore the role of science and technology in shaping societies, including their contributions to human needs and societal development, as well as ethical considerations.
5. Evaluate and distinguish between renewable and non-renewable energy resources, understanding their significance in meeting human energy needs and their environmental impacts.
6. Examine the environmental effects of various materials, including chemical plastics, textiles, and waste products, on ecosystems and human health, fostering awareness of environmental sustainability.
7. Learn about chemical and radiochemical hazards, including their sources, effects, and potential risks to human and environmental health, promoting safety and risk assessment skills.
8. Gain introductory knowledge about various fields within science and technology, providing a broad overview of their scope and importance in contemporary society.
9. Become familiar with fundamental concepts and principles of environmental studies, including sustainability, conservation, and the importance of responsible environmental stewardship.

**GST 206 Peace and Conflict resolution (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Demonstrate a clear understanding of foundational concepts in peace studies and conflict resolution.
2. Appreciate the pivotal role of peace in fostering unity and sustainable development within communities and nations.
3. Analyze and evaluate the dynamics of conflicts, identifying their causes, manifestations, and consequences.

4. Distinguish between different types of conflicts and assess their unique characteristics and implications.
5. Identify and analyze the root causes of conflicts and violence, particularly in the African context.
6. Understand the strategies and principles of peace-building and their application in real-world conflict scenarios.
7. Apply conflict management techniques and security measures to address conflicts and promote stability.
8. Apply the key elements of peace studies and conflict resolution, such as negotiation and mediation, to resolve conflicts effectively.
9. Advocate for and contribute to the cultivation of a culture of peace, emphasizing non-violence, tolerance, and reconciliation.
10. Utilize alternative dispute resolution methods like arbitration and mediation to facilitate conflict resolution.
11. Participate in constructive dialogue and arbitration processes to resolve conflicts and disputes.
12. Understand and appreciate the roles played by international organizations in conflict resolution and peacekeeping, both regionally and globally.

**AGE 200: SWEP I (2 Units: LH 30)**

**Course Content**

On the job experience in industry chosen for practical working experience but not necessarily limited to the student's major (8 weeks during the long vacation following 200 level).

Students are expected to have at least six to eight weeks Student Work Experience Programme (SWEP) immediately after 200 Level.

**300 LEVEL FIRST SEMESTER**

**AGE 301: Basic Agric. & Bio-Resources Engineering (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Understand the significance of agricultural and bio-resources engineering in addressing agricultural challenges and contributing to food production.
2. Define and identify various components of agricultural and bio-resources, including crops, livestock, and natural resources.
3. Recognize and differentiate between different tractor types, including utility tractors, row-crop tractors, and specialty tractors, based on their features and applications.
4. Identify and select appropriate farm power sources for specific agricultural tasks, considering factors such as efficiency and environmental impact.
5. Explain the functions and applications of various farm implements and match them with specific agricultural operations.
6. Safely operate tractors for field operations, conduct routine maintenance, troubleshoot common issues, and perform tractor performance tests.
7. Apply knowledge and skills to use tractors effectively in practical field operations, ensuring precision and efficiency in tasks such as plowing, planting, and harvesting.

**AGE 303: Hydrology (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Describe and draw hydrologic cycle
2. Explain evaporation and evapotranspiration, and perform data analysis.
3. Discuss different impacts of rainfall run-off on agricultural lands
4. Explain different methods of stream gauging
5. Draw hydrographs of river, channel or conduit
6. Explain stream flow routing and watershed management
7. Identify and explain different methods of flood control.

**AGE 305: Hydraulics (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Demonstrate an understanding of fluid properties and their effects on fluid behavior, such as viscosity influencing flow resistance.
2. Calculate pressure distribution in static fluids and analyze buoyant forces on submerged objects.
3. Apply the principles of continuity, Bernoulli's equation, and the energy and momentum equations to analyze and solve fluid motion problems.
4. Determine the Reynolds number for different flow situations and classify them as laminar or turbulent flows.
5. Calculate pressure drops and head losses in pipes and evaluate factors affecting the efficiency of pipe flow systems.
6. Analyze and design open channel flow systems, considering factors like channel geometry, flow rate, and hydraulic characteristics.
7. Demonstrate the ability to select, install, and operate fluid control devices such as weirs, flumes, pumps, turbines, outlets, gates, and valves for specific applications.

**AGE 307: Agricultural Engineering Laboratory Practical I (2 Credits: PH 90)**
**Course Learning Outcomes (CLOs) ?**

1. Measure soil properties measurement, infiltration and link mechanism and report them according to set guideline as well as be able to operate farm tractors successfully.

**CIE 301: Land Surveying??? (3 Credits: LH 45)**
**Course Learning Outcomes (CLOs)**

1. Survey sites using chain surveying and compass;
2. Obtain the levels at any location on a site and produce a contour map of the area;
3 Conduct a traverse to establish the boundaries of a site;
4. Undertake cadastral, leveling and topographic surveys essential for anti-soil erosion intervention.
5. Conduct leveling survey for road construction and farmstead planning.

**CIE 303: Soil Mechanics?? (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Measuring soil properties in the laboratory;
2. Interpreting and summarising the data;

3. Classifying soils;
4. Determining the optimum conditions for the compaction of soils and the ultimate amount achievable; and
5. Estimating the settlement of soils due to compaction and consolidation.

**MEE 301: Mechanics of Machines (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Demonstrate a clear understanding of the course content, that is, possess a breadth of knowledge in the area covered
2. Possess an in-depth knowledge upon which a solid foundation can be built in order to demonstrate a depth of understanding in advanced mathematical topics
3. Develop simple algorithms and use computational proficiency
4. Write simple proofs for theorems and their applications
5. Communicate the acquired mathematical knowledge effectively in speech, writing and collaborative groups.

**SSL 301: Soil Pedology and Physics (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Describe the processes involved in soil formation, including weathering, parent material, organisms, climate, and time, and how they contribute to soil development.
2. Measure and interpret soil physical properties, such as texture, structure, and bulk density, and understand their implications for soil management and plant growth.
3. Assess the role of soil colloids in nutrient retention and exchange, and explain how cation exchange capacity (CEC) influences soil fertility.
4. Measure soil pH accurately, understand its effects on nutrient availability, and apply appropriate soil amendments to adjust pH when necessary.
5. Identify common soil minerals, understand their properties, and explain their significance in soil chemistry and physical characteristics.
6. Evaluate soil organic matter content, understand its decomposition processes, and recognize its importance in soil structure, water retention, and nutrient cycling.
7. Conduct soil surveys, classify soils based on recognized systems (e.g., USDA Soil Taxonomy), and create soil maps for specific areas.
8. Describe the movement of water through soils, calculate infiltration rates, and explain how soil properties influence water retention and drainage.

**EMA 301: Engineering Mathematics III ??? (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Demonstrate a clear understanding of the course content, that is, possess a breadth of knowledge in the area covered; ????
2. Possess an in-depth knowledge upon which a solid foundation can be built in order to demonstrate a depth of understanding in advanced mathematical topics;???
3. Develop simple algorithms and use computational proficiency; ???
4. Write simple proofs for theorems and their applications; and
5. Communicate the acquired mathematical knowledge effectively in speech, writing and collaborative groups.

**GEN 301: Engineering Statistics ? (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Work with data from the point of view of knowledge convergence, machine learning, and intelligence augmentation, which significantly raises their standard for engineering analysis (the approach forces them to learn statistics in an actionable way that helps them to see the holistic importance of data analytics in modern engineering and technology). ??
2. Anticipate the future with Artificial Intelligence while fulfilling the basic requirements of conventional engineering statistical programming consistent with their future careers.
3. Perform, with proficiency, statistical inference tasks with language or programming toolboxes such as R, Python, Mathematica or MATLAB, and Design Expert to summarise analysis and interpretation of industry engineering data, and make appropriate conclusions based on such experimental and/or real-life industrial data.
4. Construct appropriate graphical displays of data and highlight the roles of such displays in data analysis, particularly the use of statistical software packages.
5. Plan and execute experimental programmes to determine the performance of programme-relevant industrial engineering systems, and evaluate the accuracy of the measurements undertaken.
6. Demonstrate mastery of data analytics and statistical concepts by communicating the results of experimental and industry-case investigations, critically reasoned scientific and professional analysis through written and oral presentation.

**300 LEVEL SECOND SEMESTER**

**GST 302: Introduction to Entrepreneurship skills 2 Credit Units**

**Course Learning Outcome (CLOs) should be the same for all our programmers based on course content**

1. Gain a solid understanding of entrepreneurship theories, including those related to business growth, innovation, and opportunity recognition, enabling them to apply these concepts in practical settings.
2. Learn about various sources of funding available for entrepreneurial ventures, including equity, loans, grants, and venture capital, enabling them to make informed financial decisions.
3. Acquire knowledge and skills related to marketing strategies, including market research, product development, pricing, promotion, and distribution, to effectively reach and serve target markets.
4. Explore the ethical aspects of business, including principles of fairness, transparency, and social responsibility, promoting ethical decision-making and responsible entrepreneurship.
5. Learn essential business management skills, including organizational management, leadership, and decision-making, to effectively manage and lead entrepreneurial ventures.
6. Develop practical knowledge and skills relevant to their chosen business area or industry, ensuring they are well-prepared to operate within their specific field.
7. Enhance entrepreneurial competencies such as opportunity identification, risk management, and problem-solving, enabling them to navigate challenges and seize opportunities effectively.

8. Gain practical insights into the challenges and opportunities of entrepreneurship in the real world, learning from real-life examples and case studies.
9. Equip students with the skills and knowledge necessary for self-employment and survival in the entrepreneurial landscape, fostering self-reliance.
10. Foster innovation and creative thinking to develop unique and competitive business ideas, promoting entrepreneurial success.
11. Apply entrepreneurial skills in practical scenarios, such as developing business plans and launching small-scale ventures, gaining hands-on experience.
12. Cultivate an entrepreneurial mindset that values adaptability, resilience, and continuous learning, preparing students for the dynamic and evolving nature of entrepreneurship.

**AGE 302: Machine Drawing and Design (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Assemble machine components into functional systems, demonstrating proficiency in spatial arrangement and the ability to troubleshoot assembly issues.
2. Produce detailed engineering drawings of machine components, adhering to industry standards for clarity and precision.
3. Utilize sketching techniques effectively and apply engineering standards, including symbols and GD&T, to convey design intent accurately.
4. Select appropriate screws, fasteners, and couplings for specific applications, considering factors like load, torque, and alignment.
5. Design and analyze gear systems and clutches, taking into account factors such as gear ratio, efficiency, and torque transmission.
6. Apply material selection, stress analysis, and safety considerations to design machine components that meet performance and safety requirements.
7. Create a comprehensive design portfolio showcasing their work in part assembly, detailed drawing, and machine component design, effectively communicating their skills and accomplishments.

**AGE 308: Agricultural Laboratory Practical II (2 Credits: PH 90)**
**Course Learning Outcomes (CLOs) Manual or CLOs?**

1. Perform various laboratory tasks and experiments related to agricultural engineering, such as soil testing, crop analysis, irrigation system testing, and machinery operation.
2. Apply fundamental engineering principles to design and conduct experiments, analyze data, and draw meaningful conclusions.
3. Practice safety protocols consistently in the laboratory and understand the potential hazards associated with agricultural engineering processes.
4. Identify, formulate, and solve engineering problems related to agriculture using both theoretical knowledge and practical experience gained in the laboratory.?
5. Collaborate effectively with fellow students to complete laboratory projects and communicate findings.
6. Operate and maintain laboratory equipment and instruments used in agricultural engineering, including sensors, data acquisition systems, and machinery.
7. Collect, record, and analyze data using appropriate software and statistical methods, and present results in a clear and organized manner.

8. Demonstrate an understanding of sustainable agricultural engineering practices and their importance in modern agriculture.
9. Communicate laboratory results and findings through written reports, presentations, and discussions.

**CIE 302: Geology for Engineers (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Describe the engineering properties of rock and soil materials;
2. Identify the geological factors affecting the performance and functioning of a facility on and in the soil and/or rock;
3. Conduct engineering geological investigations.
4. Explain the importance of engineering geology-related technical issues during construction.

**MEE 302: Metallurgy (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Explain the solidification of metals and alloys, mechanisms;
2. Explain the necessity of alloys, and identify the different types of alloy phases;
3. Gain the knowledge on various laws of diffusion and influencing factors of diffusion;
4. Define the diffusion in alloys, kirkendal effect, grain boundary diffusion and applications of diffusion;
5. Manipulate structure metals and alloys to modify their properties for specific application using appropriate scientific principles and phase diagrams; and
6. Gain the knowledge of metal deformation, hardening, transformation, and heat treatment.

**EMA 302: Engineering Mathematics IV (3 Credits: LH 45)**
**Course Learning Outcomes (CLOs)**

1. Solve second order differential equations
2. Solve partial differential equations
3. Solve linear integral equations
4. Relate integral transforms to solution of differential and integral equations
5. Explain and apply interpolation formulas
6. Apply Runge-Kutta and other similar methods in solving ODE and PDEs.

**GEN 302: Engineering Communication (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)???**

1. Demonstrate the concept of clear writing, common pitfalls and unambiguous language in engineering communication, including technical reporting for different applications and emotional comportment;
2. Demonstrate the skills of language flexibility, formatting, logic, data presentation styles, referencing, use of available aids, intellectual property rights, their protection, and problems in engineering communication and presentation; and
3. Demonstrate good interpersonal communication skills through hands-on and constant practice on real-life communication issues for engineers in different sociocultural milieu for engineering designs, structural failure scenarios and presentation of reports.

**APH 202: Principles of Animal Production (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Identify livestock for meat, wool and egg based on their features
2. Identify regional classification of animal breeds
3. Explain the various animal feeds
4. Explain artificial insemination
5. Classify and explain the equipment used in livestock processing

**CPP 202: Principles of Crop Production (2 Credits: LH 30)**

Classification and ecology of crops in Nigeria. Nutrient requirements and mineral nutrition of plants. Manures and fertilizers. Plant growth and development. Growth stages. Tillage and weed control. Other cultural practice. Cropping sequences and rotation. Farming systems. Production practices for specified crops.

**400 LEVEL FIRST SEMESTER**

**AGE 401: Farm Power and Machinery (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Identify different power sources
2. Identify different types of tractors and understand the working principle of different systems and parts of internal combustion engines.
3. To equip the students with technical knowledge and skills required for the operation of tillage, sowing and intercultural and plant protection machinery needed for agricultural farms.
4. To train the students with skills required for the operation, maintenance and evaluation of harvesting, threshing machinery needed for agricultural farms.
5. Differentiate the different types of farm tractor maintenance
6. Learn how to detect faults in farm tractors and other farm machineries and as well repair them.

**AGE 403: Irrigation and Drainage (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Explain irrigation water requirement and identify the various irrigation water sources
2. Explain different types of irrigation methods and select the appropriate irrigation rates, frequencies and timing
3. Explain irrigation scheduling and conduct an irrigation audit, assess the irrigation uniformity value resulting from this audit, and identify methods for improving the irrigation uniformity.
4. Design furrow, basin, sprinkler and furrow irrigation systems
5. Analyze the effect of poor drainage on plants and soils
6. Explain the principle of surface and sub-surface drainage

**AGE 405: Farm Structures and Environmental Control (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Identify different farm structures environmental control parameters
2. Understand the planning and layout of farmstead
3. Know how to design beams and columns

4. Design septic tanks and other sewage disposal systems from farm buildings
5. Understand the standard requirements for building various dairy, piggery, poultry and other farm structures.

**AGE 407: Properties, Handling, Processing and Storage of Agric. Materials(3 Credits: LH 45)**
**Course Learning Outcomes (CLOs)**

1. Identify and describe the properties and characteristics of different agricultural materials, including grains, fruits, vegetables, and livestock products.
2. Demonstrate the ability to apply appropriate cleaning, sorting, and grading techniques to enhance the quality and marketability of agricultural products.
3. Developed skills in the efficient and safe handling of agricultural materials, considering factors such as hygiene, ergonomics, and contamination prevention.
4. Apply various processing techniques to agricultural materials and assess their effects on product quality, nutritional value, and market appeal.
5. Design and implement crop drying processes to reduce moisture content and minimize post-harvest losses.
6. Design and manage crop storage facilities, considering factors like temperature control, humidity, and pest management, to ensure long-term product preservations

**AGE 409: Agricultural Laboratory Practical III (2 Credits: PH 90)**

**Course Learning Outcomes (CLOs)**

1. Learn how to use infiltrometer of different types to estimate infiltration rate of different soils at different locations
2. Learn how to measurement of physical and thermal properties of selected foods

**AGE 411: Farm Management, Rural Sociology and Agric. Extension (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Apply fundamental sociological concepts (e.g., social structure, culture, norms, values) to analyze and understand the dynamics of rural communities and their impact on agricultural extension programs.
2. Evaluate real-world scenarios and make informed management decisions by drawing on the principles of decision-making learned during the course.
3. Demonstrate the ability to effectively plan, organize, staff, direct, and control agricultural extension activities and resources to achieve desired outcomes.
4. Create and manage budgets, financial reports, and resource allocation strategies for agricultural extension initiatives.
5. Design and implement strategies to promote the diffusion and successful adoption of innovative agricultural practices and technologies among rural populations.
6. Develop strong communication skills, both written and oral, to convey agricultural information and engage with diverse rural communities.
7. Exhibit leadership qualities and competencies necessary for effective agricultural extension work, including building relationships, motivating stakeholders, and fostering collaboration.

**AGE 400: Students' Industrial Work Experience Scheme (SIWES) (6 Credits)**

**Course Learning Outcomes (CLOs)**

1. Proficiently operate and maintain various agricultural machines, including tractors, harvesters, and irrigation systems.
2. Demonstrate competence in using a wide array of hand tools and powered tools for tasks such as welding, cutting, and fabrication.
3. Prioritize safety by identifying potential hazards, using personal protective equipment (PPE), and adhering to safety guidelines during machine and tool operation.
4. Analyze and troubleshoot technical issues that may occur with agricultural equipment and tools, implementing effective solutions.
5. Apply knowledge and skills to optimize farm operations, resulting in increased productivity and resource efficiency.
6. Present technical information clearly and coherently through written reports and oral presentations.
7. Apply insights and practical knowledge gained during the six-month industry training to enhance problem-solving and decision-making in agricultural engineering contexts.
8. Assess the impact of the industrial training experience on personal and professional growth, and reflect on lessons learned during the training period.

**GEN 401: Economics for Engineers (2 Credits; LH 30)**
**Course Learning Outcomes (CLOs)**

1. Develop an understanding of economic analysis methods and their relevance to engineering projects, including their applications in project evaluation and decision-making.
2. Able to assess engineering projects from an economic perspective, taking into account factors such as project cost, potential revenue, and overall profitability.
3. Explore the concept of value systems and their role in economic decision-making within engineering, considering both financial and non-financial factors that influence project choices.
4. Able to make informed economic decisions related to capital investments and the selection of engineering alternatives, optimizing project outcomes.
5. Learn how to evaluate the economic viability of new engineering projects, including the application of cost-benefit analysis and risk assessment techniques to make sound investment decisions.
6. Understand the economic considerations involved in replacement and abandonment policies for engineering assets, ensuring efficient asset management.
7. Explore methods for making economic decisions in the presence of uncertainty and risk, including risk assessment, sensitivity analysis, and the incorporation of risk mitigation strategies.
8. Gain insights into corporate financial practices and how they relate to engineering projects and decision-making, helping them align engineering decisions with financial goals and organizational objectives.

**500 LEVEL FIRST SEMESTER**

**AGE 501: Seminar (1 Credit)**
**Course Learning Outcomes (CLOs)**

1. Identify problems, challenges, research gap and future perspective by reviewing literature

**AGE 503: Farm Electrification (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Identify wire codes for live, neutral and earth, know about the current national tariff and their regulations
2. Explain how power is generated from wind, sun, water, etc on farm and the transmission infrastructures
3. Identify gauges of distribution lines
4. Explain how AC and DC power can be measured using appropriate devices
5. Dissect on how electric power is used in different food handling, processing and storage facilities.
6. Identify electronics components especially the ones used in control purposes.

**AGE 505: Soil and Water Conservation (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Explain the different types of erosion and the principle of erosion by water.
2. Explain the possible methods of controlling water and wind erosion.
3. Describe/design the construction of soil conservation dams and ponds.

**AGE 507: Land Clearing and Development (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Have knowledge of the Land use Act in Nigeria
2. Identify land clearing equipment
3. Identify the rudiment of selecting land clearing equipment
4. Match appropriate land clearing equipment with vegetation type
5. Understand how to reclaim land
6. Identify earth moving machines and how they work

**AGE 509: Agricultural Mechanisation (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Identify and know the usage of different machines used for agricultural mechanization
2. Outline the principles of design of agricultural machines and implements
3. Design and construct machines used for agricultural mechanization
4. Explain ways of enhancing agricultural mechanization in developing countries.

**AGE 597 and 598: Final Year Project (6 Credits: PH 270)**

Individual student project to deepen knowledge, strengthen practical experience and encourage creativity and independent work. The project ends in a comprehensive written report.

**500 LEVEL SECOND SEMESTER**

**AGE 502: Environmental Engineering (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Understand different methods of wastewater treatment

2. Explain wastewater and solid waste disposal methods
3. Understand how to control air and noise pollution
4. Understand the concept of bio-augmentation and bioremediation

**AGE 504: Agricultural Power (3 Credits: LH 45)**
**Course Learning Outcomes (CLOs)**

1. Identify different power sources
2. Understand various types of tractors, selection, use and maintenance
3. Identify the hitches and their methods
4. Explain the factors to be consider when design
5. Understand the mechanics of tractors
6. Explain the measurement of power in agricultural field
7. Explain fluid control
8. Understand the knowledge of ergonomics
9. Explain the tractor testing and their test code

**AGE 506: Agricultural Machinery (3 Credits: LH 45)**
**Course Learning Outcomes (CLOs)**

1. Explain the forces acting on different farm machinery
2. Identify the hitching methods
3. Explain the design consideration of different farm machinery
4. Explain the power requirement for operation of farm equipment and machines
5. Explain operational maintenance of farm machinery
6. Explain field evaluation and criteria for replacement
7. Determine the cost analysis of agricultural machines

**AGE 508: Design of Agricultural Machines (2 Credits: LH 30)**
**Course Learning Outcomes**

1. Carry out design of machines
2. Select appropriate material for the construction of machines
3. Carry out design of low-cost farm machineries
4. Understand current problems and prospects of farm machinery development and market

**AGE 510: Farm Transportation (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Differentiate different types of farm roads
2. Have in-debt knowledge on development and construction of farm transport equipment
3. Identify different farm transport systems and their specifications
4. Explain how the environment and machinery operation induce different effects on the efficiency of farm workers

**AGE 512: Operation and Management of Farm Power and Machinery Systems (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Learn how to select appropriate machinery for a specific task
2. Learn how to schedule work task of machineries
3. Explain company profitability when compared to its revenue

4. Learn how to maximize machine efficiency
5. Gain knowledge based on case studies

**AGE 514: Mechanics of Deformable Bodies (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**
At the end of the course students should be able to:

1. Explain the three-dimensional stress and strain, failure and strain concentration
2. Identify various moments and products of inertia and area
3. Explain Mohr's strain and inertia circles
4. Determines unsymmetrical bending, shear center and curved beams

**AGE 516: Automotive Service and Maintenance (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. To learn how to services and maintain the components of automobile

**AGE 518: Renewable Energy Engineering (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Explain the renewable energy resources, development utilization and environmental impact assessments
2. Understand the design process and equipment for biomass, biofuel and biogas production
3. Explain the various storage and distribution of biogas for domestics and industrial use

**AGE 520: Industrial Studies (2 Credits: LH 30)**
**Course Learning Outcomes (CLOs)**

1. Gain knowledge of industrial management such as production management, quality management, human resources management, and marketing management;
2. Analyze, evaluate and solve problems in organization and business;
3. Aware of professional ethics;
4. Design production system and planning; and
5. Able to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

**AGE 522: Irrigation (3 Credits: LH 45)**
**Course Learning Outcomes (CLOs)**

1. Explain irrigation water requirement and identify the various irrigation water sources
2. Explain different types of irrigation methods and select the appropriate irrigation rates, frequencies and timing
3. Explain irrigation scheduling and conduct an irrigation audit, assess the irrigation uniformity value resulting from this audit, and identify methods for improving the irrigation uniformity.
4. Design furrow, basin, sprinkler and furrow irrigation systems
5. Analyze the effect of resulting poor drainage on plants and soils
6. Explain the principle of surface and sub-surface irrigation.

**AGE 524: Agricultural Land Drainage (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Explain surface and subsurface drainage
2. Design drainages
3. Design envelope materials
4. Explain the concept of drainage pumping
5. Understand the construction and installation of drains and their maintenance

**AGE 526: Advanced Hydraulics (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Explain the various pipe networks used in fluid transport
2. Differentiate between open channel and pipe flow
3. Understand the application of dimensional analysis and similitude in modeling and study of flow in pipes
4. Understand reservoir hydraulics and planning
5. Understand the application of flow-control structures, such as gates and valves in the control of channel and pipe flows

**AGE 528: Rural Water Supply and Sanitation (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Identify water borne diseases
2. Assess water quality and proffer appropriate treatment method
3. Identify pipes of different sizes and how water is distributed via pipes
4. Explain the state-of-the- art waste disposal systems in rural homes and other waste disposal systems

**AGE 530: Design of Irrigation and Soil Conservation Structures (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Explain the different types of erosion and the principle of erosion by water
2. Explain the possible methods of controlling water and wind erosion
3. Describe the construction of dams and ponds.

**AGE 532: Foundation Engineering (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Locate the site and the position of load based on soil stress distribution and perform time rate consolidation analysis
2. Inspect the site for any geological or other evidence that may indicate a potential design problem such as slope stability
3. Explain the bearing capacity and settlement of soils of shallow and deep foundation
4. Design foundation footings
5. Perform a retaining wall analysis including sliding and overturning considerations

**AGE 534: Basic Aquacultural Technology (3 Credits: LH 45)**

**Course Learning Outcome (CLOs)**

1. Differentiate between the Flow-through and Recirculating Aquaculture systems
2. Explain and demonstrate the concept of water mass balance, loading rate, and gas transfer in aquaculture

3. Understand the various water treatment and sterilisation methods for water reuse in aquaculture
4. Learn about the principle of construction of aquaculture buildings and structures
5. Learn about the concept of aquaponics in integrated aquaculture

**AGE 536: Advanced Thermodynamics (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Apply thermodynamic principles to analyze and solve complex problems related to gases, vapors, and mixtures, demonstrating proficiency in using relevant equations and concepts.
2. Analyze and predict phase equilibria in gas-vapor systems, including understanding phase diagrams and identifying critical points in various substances.
3. Describe and analyze various thermodynamic processes, including isothermal, isobaric, isochoric, and adiabatic processes, in the context of gases and mixtures.
4. Predict and quantify the behavior of reactive mixtures, including the calculation of heat release, equilibrium constants, and the effect of temperature and pressure on chemical reactions.
5. Evaluate the behavior of non-reactive mixtures, distinguishing between ideal and non-ideal behavior and applying appropriate equations of state.
6. Learn the concept of thermodynamic equilibrium and the differences between reversible and irreversible processes, and apply these concepts to assess the efficiency and feasibility of energy conversion processes.
7. Apply the knowledge gained in the course to solve practical engineering and scientific problems related to the thermodynamics of gases, vapors, and mixtures, considering both theoretical and experimental aspects.

**AGE 538: Engineering Properties and Handling of Agricultural Materials (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Describe and categorize agricultural materials based on their physical, mechanical, rheological, and thermal properties.
2. Analyze the behavior of agricultural materials under various mechanical and thermal conditions, predicting their response in handling and processing.
3. Choose suitable handling methods and equipment for specific agricultural materials, considering safety, efficiency, and product integrity.
4. Develop designs for material handling equipment customized for tropical agricultural products, demonstrating proficiency in equipment design principles and calculations.
5. Optimize material handling processes to minimize costs, reduce wastage, and enhance overall efficiency while adhering to sustainability principles.
6. Evaluate the economic implications of material handling decisions, including cost-benefit analyses and the long-term sustainability of handling practices.
7. Communicate findings and recommendations related to material properties, handling methods, and equipment design through written reports and oral presentations.
8. Apply the acquired knowledge and skills to solve practical challenges in handling and processing tropical agricultural products, addressing real-world problems in the field.

**AGE 540: Processing and Storage of Agricultural Products (3 Credits: LH 45)**
**Course Learning Outcomes (CLOs)**

1. Evaluate and select appropriate cleaning, sorting, grading, and separation techniques for specific agricultural produce based on quality and market requirements.
2. Operate and maintain various post-harvest handling machines effectively and safely.
3. Communicate effectively with colleagues and stakeholders involved in the post-harvest handling process to ensure the quality and safety of agricultural produce.
4. Conduct particle size analysis and make informed decisions regarding product handling and processing.
5. Apply heat treatment methods to control pests, pathogens, and spoilage microorganisms in agricultural produce.
6. Implement dehydration and drying processes to reduce moisture content and extend the shelf life of agricultural products.
7. Calculate and control humidity and temperature levels using psychrometric principles in storage facilities.
8. Select appropriate storage types and environments based on the specific requirements of different agricultural products.
9. Identify, prevent, and address factors contributing to the deterioration of agricultural produce during storage, such as temperature fluctuations and pest infestations.
10. Utilize containerization techniques to improve the handling and transportation of agricultural produce.
11. Design grain storage structures that meet safety and quality standards while maximizing storage capacity.
12. Implement environmental control measures to maintain the quality and safety of agricultural produce during storage, such as proper ventilation and temperature management.

**AGE 542: Solar Energy Applications to Processing and Storage (2 Credits: LH 30)**

**Course Learning Outcomes (CLOs)**

1. Demonstrate a comprehensive understanding of solar radiation, heat transfer mechanisms, and solar energy conversion technologies.
2. Analyze and calculate the energy efficiency and performance of solar heating and cooling systems.
3. Design and optimize solar collector systems based on specific requirements and constraints.
4. Implement appropriate solar heat storage solutions for different applications, including tropical crop storage.
5. Apply the principles learned in class to real-world scenarios, solving problems related to solar energy utilization.
6. Evaluate the sustainability and environmental impact of solar heating and cooling systems in tropical regions.
7. Propose innovative solutions for the efficient utilization of solar energy in agriculture, particularly for tropical crop storage.

8. Communicate complex technical concepts and solutions related to solar energy effectively, both in writing and orally.

**AGE 544: Bioprocess Engineering (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Apply the principles of unit operations to analyze and solve problems in food and bioproduct processing.
2. Demonstrate proficiency in process measurement and control techniques, including data collection, analysis, and process optimization.
3. Perform energy and momentum balance calculations to assess and improve process efficiency in food and bio-product manufacturing.
4. Explain the trans-esterification process and its role in producing biofuels and other bioproducts, and perform related calculations.
5. Describe microbial production systems and their applications, and evaluate their performance and -efficiency.
6. Design and analyze bioreactors for various bioproduct production processes, taking into account key engineering parameters.
7. Apply engineering systems and methodologies to develop new products and processes in the food and bioproduct industry, considering factors such as quality, safety, and sustainability.

**AGE 546: Fundamentals of Food Engineering I (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Explain the underlying principles of various food processing methods and apply them to specific food products.
2. Evaluate and select appropriate techniques and processes for food preservation based on the characteristics of different food items and their intended shelf life.
3. Demonstrate proficiency in the operation of equipment used for food preservation and processing.
4. Analyze the principles and steps involved in flour and bread making, and produce quality bread products.
5. Understand the key steps in brewing, from raw materials to fermentation, and be capable of brewing beverages with desired characteristics.
6. Apply the principles and techniques of dairy product processing to produce a range of dairy products, including pasteurized milk and cheese.

**AGE 548: Aquacultural and Animal Production Engineering (3 Credits: LH 45)**

**Course Learning Outcomes (CLOs)**

1. Have a comprehensive understanding of the entire fishery production and processing chain, from harvesting to packaging.
2. Be proficient in identifying and utilizing various types of machinery and structures employed in fishery operations.
3. Design and modify machinery for specific tasks such as slaughtering, cutting, and packaging, while considering safety and efficiency.
4. Ensure that fishery operations meet safety and quality standards, adhering to regulatory requirements and industry best practices.

5. Learn the importance of sustainable practices in fishery operations and be able to contribute to environmentally responsible processes.
6. Have hands-on competence in operating and maintaining fishery machinery and equipment, minimizing downtime and optimizing productivity.
7. Have the ability to identify and solve problems related to fishery machinery design, operation, and maintenance.
8. To engage with the fishery industry, staying current with industry trends and contributing to the ongoing development of fishery operations and machinery.

## 2.12 Departmental Staff List of Agricultural Engineering

**Table 4:** Academic staff

| S/N | Name | Present Rank | Highest Qualification | Phone No. |
|---|---|---|---|---|
| 1. | Engr. Prof. Samuel Baba Onoja | Professor | **Ph.D.** Agric. Engineering<br>B. Sc(OAU), M. Eng (UNN), Ph.D. (UNN) | 08053453383 |
| 4. | Engr. Dr. Ngabea, Shianya Audu | Senior Lecturer | **Ph.D.** Agric. Engineering (Food & Bioprocess Eng'g) B.Eng (FUTY), MSc (UNN), Ph.D. (UNN) | 08038083111;<br>08024567172 |
| 5 | Engr. Dr. Abdulhakim Adeoye Shittu | Senior Lecturer | **Ph.D.** Civil Eng'g (Structural/Reliability Eng'g). B. Eng(ABU), MSc(ABU), MSc. (Newcastle), Ph.D. (Cranfield) | 08063209220;<br>09023370861 |
| 6. | Engr. William Joshua Kwari | LI | **M.Sc** Civil Engineering<br>B. Eng(UNIMAID), MSc.(Glassgow) | 08061257792 |
| 7. | Engr. Ambo Mamai Ezekiel | LI | **M.Eng** Agric. Engineering | 07034890134 |
| 8. | Engr. Hemen E. Jijingi | LI | **M.Sc** Agric. Engineering<br>B. Eng (UAM), MSc (ABU) | 08069451802;<br>08024347824 |
| 9. | Engr. Kodak E. Udemba | LI | **M.Sc** Agric. Engineering | 09091427288 |
| 10. | Engr. Bassah E. | LI | **M.Sc** Civil Engineering | 07062094244 |

| | | | | |
|---|---|---|---|---|
| | John | | B. Eng (ABU), MSc (UNN) | |
| 11. | Engr. Ayuba Solomon | LI | **M.Eng** Civil Engineering<br>B. Eng (FUTY), M. Eng (BUK) | 08068227651 |
| 12. | Engr. Bobby Shekarau Luka | LI | **M.Eng** Agric. Engineering<br>B. Eng(FUTY), M. Eng(ATBU) | 08066828448 |
| 13. | Engr. Idris W. Muhammed | LII | **M. Tech** Agric. Engineering<br>B. Eng (BUK), MTech. (India) | 08032241576 |
| 14. | Makhai N. Usman | LI | **M.Eng** Agric. Engineering<br>B. Eng (UNIMAID), M.Eng (UNN) | 07038677544 |
| 16 | Ibrahim B. Mahhamed | LI | **M.Tech** Agric. Engineering<br>B. Eng (BUK), M.Tech (India) | 08069132463 |
| 17. | Usman Mohammed Mumini | GA | **B.Eng** Mech. Engineering | 08037492017 |
| | | | | 08032979351 |

**Table 5:** Technical staff

| **S/N** | **Name** | **Present Rank** | **Highest Qualification** | **Phone No.** |
|---|---|---|---|---|
| 1. | Inusa Adamu | Senior Engineer | **B.Eng** Agric. Engineering<br>B. Eng (UNIMAID) | 07030354920; 09024594567 |
| 2.. | Sambo Ali Dauda | Principal Tech. | **PGD** Agric. Engineering<br>HND (KADPOLY), PGD (ABU) | 07067102525 |
| 3 | Genesis Ishaya | Principal Tech. | **M.Eng** Agric. Engineering<br>HND (), PGD (), M. Eng (FUTY) | 08137133524 |

| | | | | |
|---|---|---|---|---|
| 4. | Adamu A. Danladi | Tech. II | **HND** Agric. Engineering<br>HND (KADPOLY) | 08033614090 |
| 5. | Musa Ibrahim Abubakar | Tech. II | **HND** Agric. Engineering<br>HND (FPTB) | 0138288553 |
| 6. | Biami Rita Sih | Scientific Officer | **B.Eng** Agric. Engineering | 08107459150;<br>07034666504 |
| 7 | Sylvester A. Wanje | Tech. II | **B.Eng** Agric. Engineering<br>B. Eng () | 08030581046 |