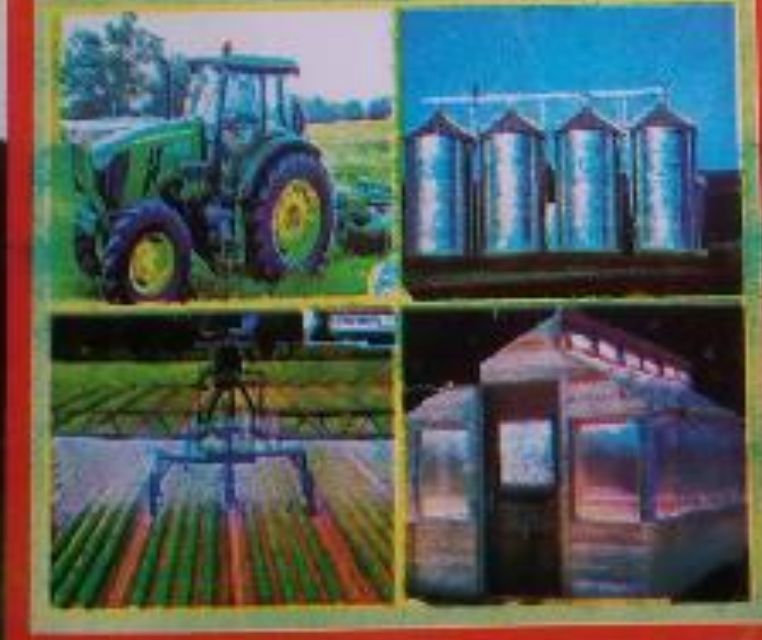
MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE ABIA STATE



AGRICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT

STUDENTS' HANDBOOK

MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE

AGRICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT HANDBOOK

REVISED 2022

FOREWORD

This handbook is prepared to guide and enable you acquire university education. It is designed to ensure that you abide by the instructions contained therein, and to be of good behaviour.

Engr. Dr. O. Oduma
Head of Department
2022.

1. PHILOSOPHY AND OBJECTIVES OF THE DEPARTMENT

A non-reader will believe anything, accept anything and worse still, fall for anything.

The primary philosophy guiding the training of Agricultural & Bioresources Engineering students at Michael Okpara University of Agriculture, Umudike, is the production of skilled professional manpower solidly grounded in the basic sciences and engineering. Such professional manpower has to be produced through the adoption of effective techniques of instruction and exposure to actual practice of engineering and agriculture in the content of globalization and the prevailing role of Information and Communications Technologies (ICT).

In general, the major objectives of the Agricultural & Bioresources Engineering training at Michael Okpara University of Agriculture, Umudike is to train engineers who can employ their training to address the agricultural needs of the nation in particular and of human society generally.

In specific, the programme aims at:

(i) Training engineers who are conversant with the application of scientific and engineering principles to agricultural mechanization and food production; processing, preservation, and storage; and soil and water resources development and management.
(ii) Enabling the attainment, in the shortest possible time, of self-sufficiency in the production of basic food through the application of engineering techniques
(iii) Facilitating the attainment of capability for the production and processing of produce for export.
(iv) Enhancing rural employment opportunities and improving the quality of rural life.
(v) Being self-reliant and enhancing employment opportunities.
(vi) Providing adequate leadership, guidance and supervision of complex engineering projects.

1.1 Vision of the University and the Department

The University has a vision to serve Nigeria and humanity through processes that will lead to the alleviation of hunger.

The Vision of the University encapsulates its original purpose and what used to be referred to as its Mission and Mandate. The rehearsing of this vision gives anyone associated with it the expectations of the Institution. The University aims to provide the knowledge base for achieving food security, hence its motto: Knowledge, Food and Security.

In addition to this, the department holds the vision to be a leading destination in the Sub-Saharan Africa for industrial solutions and manpower training and development in Electrical and Electronic Engineering processes leading to industrialization and food security.

1.2 Mission

To provide high-quality practical training for students to become professionally competent and confident persons capable of self-employment, to develop environment-friendly and personsensitive technologies, and to enhance the well-being of the people through extension services and other interventions.

1.3 Core Values

Excellence, Integrity, Commitment, Diligence, Truth, Respect, Fairness and Justice.

1.4 Programme Educational Objectives (PEOS)

The Programme's Educational Objectives are geared towards the realization of national needs and aspirations. They are also designed with consideration to the visions and missions of the University. These PEOs are published in the Students' Handbook of the Department of Agricultural and Bioresources Engineering, Michael Okpara University of Agriculture Umudike. The minimum expectations on the graduates of the Agricultural and Bioresources Engineering Department embodies the PEOs, which are as in Table 1.1.

Table 1.1: Programme Educational Objectives

S/N	PEO
PEO1	Develop entrepreneurial skills and knowledge, with the spirit of self-reliance, so that they can set up their own businesses.
PEO2	Design, develop and produce innovative policies, products, and services for industrial growth and food security in Nigeria.
PEO3	Adapt and adopt indigenous technology in order to solve engineering and technological problems of the Nation.
PEO4	Function effectively both as an individual and as a team member or leader in diverse and in multi-disciplinary settings.
PEO5	Be thoroughly equipped for postgraduate studies.

1.5 PROGRAMME OUTCOMES (POS)

Programme Outcomes refers to the capabilities the graduates of the Programme are expected to acquire from the training provided by the Programme. The programme outcomes of the Department of Agricultural and Bioresources Engineering of Michael Okpara University of Agriculture Umudike are presented in table 1.1, showing also the relevant graduate characteristics.

Table 1.2: Programme Outcomes and Graduate Characteristics

S/N	Characteristic	Programme Outcome (Engineer Graduate Profile)
PO1	Engineering Knowledge	Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in K1 to K4 respectively (see Annex A-2) to develop solutions to complex engineering problems
PO2	Problem Analysis	Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development* (K1 to K4)
PO3	Design/ development of sustainable solutions	Design creative solutions for complex engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required (K5)
PO4	Investigation	Conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (K8)
PO5	Modern Tool Usage	Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems (WK2 engineering and K6)
PO6	The Engineer and the World	When solving complex engineering problems, analyse and evaluate sustainable development impacts* to: society, the economy, sustainability, health and safety, legal frameworks, and the environment (K1, K5, and K7).
PO7	Ethics	Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and

		international laws. Demonstrate an understanding of the need for diversity and inclusion (K9)
PO8	Individual and Collaborative Team work	Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings (K9)
PO9	Communication	Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences.
PO10	Project Management and Finance	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	Lifelong learning:	Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (K8)
PO12	Adapting Indigenous Technology and Local Materials in the agrarian communities	Apply engineering and technological principles to simplify, facilitate, modernize, and optimize traditional processes and methods in farming, harvesting, and food preservation; ability to employ locally sourced materials in providing engineering and technological solutions.

1.6 Knowledge Attribute Profile

The curriculum shall encompass the knowledge profile as summarised in the table 1.3:

Table 1.3: Knowledge Attribute Profile

S/No.	Attribute
K1	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences
K2	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling as it applies to Agricultural and Bioresources Engineering.
K3	A systematic, theory-based formulation of engineering fundamentals required in Agricultural and Bioresources Engineering.
K4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in Agricultural and Bioresources Engineering.
K5	Design creative solutions for complex engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required.
K6	Knowledge of engineering practice (technology) in the practice areas in Agricultural and Bioresources Engineering..
K7	Knowledge of the role of engineering in society and identified issues in engineering practice in Agricultural and Bioresources Engineering, such as the professional responsibility of an engineer to public safety and sustainable development.
K8	Engagement with selected knowledge in the current research literature of Agricultural and Bioresources Engineering, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
K9	Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

The UN Sustainable Development Goals (UN-SDG) informed the development of these knowledge profiles.

1.7 Definition of Complex Problem Solving

The range of complex problem solving which the graduate of Agricultural and Bioresources Engineering must be capable of is defined in table 1.4. In table 1.4, complex engineering problems have characteristics P1 and some or all of P2 – P7.

Table 1.4: Range of Complex Problem Solving

Attribute	Complex Engineering Problems Characteristic
Depth of Knowledge Required	P1: Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach
Range of conflicting requirements	P2: Involve wide-ranging and/or conflicting technical, nontechnical issues (such as ethical, sustainability, legal, political, economic, societal) and consideration of future requirements
Depth of analysis required	P3: Have no obvious solution and require abstract thinking, creativity and originality in analysis to formulate suitable models
Familiarity of issues	P4: Involve infrequently encountered issues or novel problems
Extent of applicable codes	P5: Address problems not encompassed by standards and codes of practice for professional engineering
Extent of stakeholder involvement and conflicting requirements	P6: Involve collaboration across engineering disciplines, other fields, and/or diverse groups of stakeholders with widely varying needs
Interdependence	P7: Address high level problems with many components or sub-problems that may require a systems approach

1.8 Definition of Complex Engineering Activities

The range of complex engineering activities is defined in Table 1.5. Complex engineering activities refer to activities or projects that have some or all the characteristics of Table 1.5.

Table 1.5: Range of Complex Engineering Activities

Attribute	Complex Activities
Preamble	**Complex activities** mean (*engineering*) activities or projects that have some or all of the following characteristics:
Range of resources	A1: Involve the use of diverse resources including people, data and information, natural, financial and physical resources and appropriate technologies including analytical and/or design software
Level of interactions	A2: Require optimal resolution of interactions between wide-ranging and/or conflicting technical, non-technical, and engineering issues

Innovation	A3: Involve creative use of engineering principles, innovative solutions for a conscious purpose, and research-based knowledge
Consequences to society and the environment	A4: Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
Familiarity	A5: Can extend beyond previous experiences by applying principles-based approaches.

2.0 BRIEF HISTORY OF AGRICULTURAL & BIORESOURCES ENGINEERING DEPARTMENT

"Do not undertake a journey without knowing the destination"

The establishment of specialized Universities of Agriculture in Nigeria is a milestone in the nation's educational and developmental history. The Michael Okpara University of Agriculture, Umudike was established by Edict No. 48 of the Federal Government of Nigeria in May 1993 with the central mandate and mission of imparting agricultural education in a scientific and practical way, undertaking applied research and such extension services that would assist the achievement of national self-sufficiency in food production and catalyzing, as well as sustaining rural development.

Thus, the University operates unique academic programmes which are carefully planned to meet the manpower requirements for an agricultural revolution in the country. The programmes are woven into the overall mandate and mission of the University taking into consideration all necessary criteria, indicators and peculiarities of the specialized nature of a University of Agriculture.

The University is located in the well-known Agricultural Training and Research city of Umudike, about 10 kilometers from Umuahia, Abia state. It lies between longitude 70 and 70 05' E and Latitude 50 and 50 25' N. The major link road is the Umuahia-Ikot Ekpene Federal road; a direct route to the state capitals of Abia, Akwa-Ibom and Cross River states.

In due course, it became clear that the mission of the Institution could not be properly achieved, neither could Agriculture be successfully developed nor meaningfully utilized in the industrialization and sustenance of the nation without an accompanying College of Engineering. Thus in 2001/2002 academic session, the College of Engineering and Engineering Technology came into existence with the establishment of the Department of Agricultural Engineering as the

first engineering Department. The Department run a 5-year degree programmes leading to the award of the Bachelor of Engineering (B. Eng) Degree.

The Department has three (3) major options namely: Agricultural Products Processing/ Storage and Food Engineering, Farm Power and Machinery Engineering and Soil and Water Resources Engineering. Currently, the department is known as the Department of Agricultural and Bioresources Engineering as fallout from COREN accreditation.

As part of the fallout from the NUC and COREN visitations for accreditation in 2008 and 2010, respectively, the Department's name was changed to Agricultural and Bioresources Engineering in 2011. The addition of *Bioresources* to the department's name is to broaden the objectives of the department in developing the area of food, fibre, and timber products.

Dr. O. Onuba who started the College of Engineering was also the first Head of the Department of Agricultural Engineering. Currently Dr. O. Oduma heads the Department. The Department has graduated 12 sets of students. However, did not admit students in 2007/2008 academic session because the Department was not accredited in 2006. The Department as at 2022/2023 had a total of 412 students broken down as follows:

Year 2 = 87

Year 3 = 100 students

Year 4 = 110 students

Year 5 = 115 students

T0tal = 412

The academic staff of the Department are 24 in number broken down as follows: Professor (9), Associate Professor (1), Senior Lecturer (3) and Lecturer 1 and others (10).

3.0 UNDERGRADUATE (B.ENG DEGREE) PROGRAMME

"Reading does to the mind what food does to the body."

3.1. Introduction

Engineering is the discipline that deals with the art of applying scientific knowledge to practical problems. The scientific study of living things (biology), agriculture, bioresources, and natural resources resulted into various branches of engineering called Agricultural, Biological, hBiosystems, Bioresources, and/or Bioenvironmental Engineering. The addition of Bioresources

to the department's name is to broaden the objectives of the department in developing the area of food, fibre, and timber products.

3.2. Scope

The study of Agricultural & Bioresources Engineering can be specialized in the following options namely: Soil and Water Resources Engineering, Farm Power and Machinery Engineering as well as Agricultural Products Processing and Food Engineering. Agricultural & Bioresources Engineering Department combines all these options to produce broad trained graduates that are versatile for professional jobs in both the public and private sectors.

Agricultural & Biorseources Engineering Department adds a biotechnological dimension to engineering technology by studying and understanding the principles of crop and livestock production as well as the strength and properties of soils, plant and animal materials and possible energy generations from biomaterials. But like any other engineering field, Agricultural Engineering & Bioresources education must have a strong physical science base, with special attention to Physics, Chemistry and Mathematics. It requires an understanding of the engineering science particularly in the areas of materials, fluid and heat flow, computations and mechanisms.

In pursuance of the above, specific features have been incorporated into the programme. These include:

i. Common foundation year at 100 and 200 levels for all engineering students

ii. Workshop practice, laboratory work, tutorials, seminars on specific topics, farm machinery and field operations.

iii. Broad based engineering and interaction between students and professionals.

iv. Adequate knowledge in the areas of engineering management, economics and law.

v. Design projects with bias towards local applications.

vi. Supervised SIWES experience at the 400 level of study

vii. Final year projects in which students work alone under supervision in specific options of Agricultural & Bioresources Engineering.

The academic programme has been placed to offer challenges, and to encourage the development of ingenuity and originality in the students.

3.3. Entry Requirements

The department offers a five year programme for the Bachelor of Engineering (B.Eng.) Honours Degree in Agricultural and Bioresources Engineering.

(i) **UME Admission:** The admission requirement for UME candidates into the course is a minimum of 5 (ordinary) credit passes in West African Senior Secondary School Certificate (WASSSCE) or General Certificate of Education (GCE) or National Examination Council Ordinary level (NECO) in not more than two sittings. The credits must be obtained in English language, Mathematics, Physics, and Chemistry. The remaining one is preferably Biology or Agricultural Science. The candidate must not be below 16 years of age. A pass in JAMB that meets the departmental cut off mark determined by the university and post-UTME screening exercise is required.

(ii) **Direct Entry Candidates:** Direct entry admission is based on a combination of O'Level results with the following qualifications:

(a.) G.C.E or HSC (A Level two papers in Physics, Mathematics or Chemistry)

(b.) OND (Upper credit)

(c.) HND (Upper credit).

Candidates with qualifications as in (a) and (b) above may be admitted into the 200 level and those with the qualifications in (c) above may be admitted into the 300 level. All must meet the basic minimum requirement of five O'Level credit passes in relevant subjects specified in (i) above.

(iii) **Admission by Transfer**: The University may admit on transfer a student undergoing undergraduate degree programme in another recognized University provided such a student meets the minimum admission requirements of this University and is seeking transfer to a programme similar to the one he is in the present University. Students seeking transfer into the university must possess a minimum CGPA of 3.5. Application for transfer shall be made on the approved application form obtainable from the Registrar's Office on the payment of the stipulated application fee approved by Senate.

3.4. Period of Formal Studies in the University

The university runs a two semester calendar in one session; each semester lasts for a period of about 15 weeks. Departmental course of study is structured in such a way that a minimum of five years is required. The first year is devoted to preliminary university courses. The second and third year courses expose the student to some related courses and basic foundation college courses, design to broaden his/her knowledge and appreciate engineering. The remaining two years are

devoted to specialized courses in the field of agricultural engineering. Students in 200 and 300 levels (i.e. 2nd and 3rd year students) go for 3 months industrial training, at the end of the session. The 400 level (4th year) students undertake a 6 months industrial training. This takes the whole of second semester and long vacation. Within this period, students go for Students Industrial Work Experience Scheme (SIWES) in places related to their areas of specialization. Excursion is taken during each academic year to further expose them to appreciate the application of what they were taught. The 500 level (final year students) carryout individual projects as a partial requirement to be fulfilled for the award of B.Eng. degree of the department.

3.5. Registration of Courses

All the students are expected to register their courses at the beginning of each semester according to their levels and in line with the course curriculum. The normal period of registration is five days from the beginning of the semester. For fresh students, the late registration begins after matriculation and ends after specified period normally indicated by the senate approved university calendar.

Every student should meet his academic adviser who will guide him / her on the mode of course registration. Students above 100 Level must ensure that they register their failed courses before registering courses at their current Level. Any course registered earns the student F grade, if the examination is not taken by him / her.

3.6. Grading Systems

Examination of students comprises of continuous assessment and semester examination at the end of each semester. Continuous assessment, which includes quizzes, tutorials, homework, tests and viva, carries 30% score, while written examination is allotted 70% score. A student must have attended at least 75% lectures to be eligible to write the semester examination. In addition, he/she must have done class assignments and tests for continuous assessment to a final grade on the subject. Examination done without continuous assessment will earn a student a grade of Failure (F) regardless of score made over 70%.

The student shall be examined and graded under the following scheme shown in the Table 1.

TABLE 1

SCORE (%)	GRADE	POINT (GP)	DESCRIPTION
70-100	A	5	EXCELLENT
60-69	B	4	VERY GOOD
50-59	C	3	GOOD
45-49	D	2	FAIR
44- BELOW	F	0	FAIL

3.7. Graduation and Standard of Degree

A student is expected to score a minimum of 45% total in his final year study in the programme. This is base on the University Senate's decision at its 163rd regular meeting held on Thursday, 8th January, 2015; which considered the National Universities Commission's (NUC) letter to the vice-chancellor, referenced NUC/AS/391/Vol.11, and dated 15th March, 2013, mandating the abolition of the award of "Pass" Degree in Nigerian Universities with effect from 21013/2014 academic session.

In effect, the classification of degrees in the Nigerian Universities terminates at third class division as follows:

TABLE 2

CLASS OF DEGREE	MARKS OBTAINABLE	CUMULATIVE G.P.A.
First Class Degree	70 – 100	4.50-5.00
2nd Class Upper Degree	60 – 69	3.50-4.49
2nd Class Lower Degree	50 – 59	2.40-3.49
3rd Class Degree	45 – 49	1.50-2.39

It follows therefore that third class is the least class of degree in Nigerian Universities. The NUC as the sole regulatory agency for the orderly development of universities in Nigeria is vested with the mandate of the definition and maintenance of standards in the system.

3.8. Agricultural & Bioresources Engineering (B.Eng.) Degree Curriculum

The curriculum presented herein is in line with the special training needs and the minimum academic standard of the NUC.

FIRST YEAR (100 LEVEL) FIRST SEMESTER

COURSE CODE	COURSE TITLE	UNITS
ENG 111	Introduction to Engineering	1
MTH 112	Elementary Mathematics I (General Mathematics)	3
PHY 111	General Physics I	2
PHY 112	Elementary Physics I	2
PHY 117	General Physics Lab I	1
CHM 113	General Chemistry I	3
CHM 114	Practical Chemistry I	1
GSS 111	Use of English I	1
GSS 112	Nigerian History	2
GSS 114	Elementary French I	1
GSS 115	Basic German I	1
GSS 116	Use of Library	1
UGC 111	Farm Practice	1
	Total Units	**20**

FIRST YEAR (100 LEVEL) SECOND SEMESTER

COURSE CODE	COURSE TITLE	UNITS
ENG 121	Computer Applications and Information Technology	2
MTH 122	Elementary Mathematics II	3
MTH 123	Introduction to Vectors	3
PHY 121	General Physics II	2
PHY 122	Elementary Physics II	2
PHY 127	Physics Lab II	1
CHM 121	General Chemistry II	3
CHM 124	Practical Chemistry II	1
GSS 121	Use of English II	2

GSS 124	Elementary French II	1
GSS 125	Basic German II	1
GSS 126	Social Science	2
	Total Units	**23**

SECOND YEAR (200 LEVEL) FIRST SEMESTER

COURSE CODE	**COURSE TITLE**	**UNITS**
ENG 211	Engineering Thermodynamics I	3
ENG 212	Workshop Technology/Practice I	2
ENG 213	Basic Electrical Engineering	3
ENG 214	Engineering Drawing I	2
ENG 215	Engineering Mechanics	3
MTH 211	Mathematical Methods I	3
MTH 214	Linear Algebra I	2
GSS 212	Peace & Conflict Resolution Studies	2
GSS 217	Philosophy and Logic	2
	Total Units	**22**

SECOND YEAR (200 LEVEL) SECOND SEMESTER

COURSE CODE	**COURSE TITLE**	**UNITS**
ENG 221	Strength of Materials I	2
ENG 222	Engineering Drawing II	2
ENG 223	Computer Programming	3
ENG 224	Materials Science	2
ENG 225	Fluid Mechanics I	3
ENG 226	Engineer in Society	1
ENG 200	Student Work Experience Program (SWEP I)	1
ABE 221	Agric and Bio-Resources Engineering Concepts	1
MTH 221	Mathematical Methods II	3
STA 224	Statistics for Physical Science & Engineering	3
GNT 221	Entrepreneurship Studies	2
	Total Units	**2**

THIRD YEAR (300 LEVEL) FIRST SEMESTER

COURSE CODE	COURSE TITLE	UNITS
ENG 311	Engineering Economics	2
ENG 313	Engineering Analysis	3
ABE 311	Engineering Hydraulics I	2
ABE 312	Soil Mechanics II	2
ABE 315	Automotive Services and Maintenance	2
SSA 311	Introduction to Soil Science & Soil Tillage	2
EME 311	Mechanics of Machine I	2
EME 315	Strength of Materials II	3
CCS 311	Agricultural Biotechnology	1
GNT 311	Business Development and Management	2
AEX 311	Introduction to Agric. Extension & Rural Sociology	2
	Total Units	**23**
*ABE 314	Introduction to Agro-Resources Engineering and Drawing	2

*Service Course to B. Agric. Program

THIRD YEAR (300 LEVEL) SECOND SEMESTER

COURSE CODE	COURSE TITLE	UNITS
ENG 300	Student Work Experience Program (SWEP II)	1
ENG 326	Technical Report Writing and Presentation	1
ABE 321	Machine Component Design and Presentation	2
ABE 322	Agricultural Land Surveying	3
ABE 323	Engineering Hydrology	3
ABE 324	Geology for Agricultural Engineering	3
CPP 324	Crop Production for Engineers	3
CAS 321	Animal Production for Engineers	3
EME 321	Engineering Thermodynamics II	3
EME 324	Engineering Metallurgy	2
	Total Units	**24**

FOURTH YEAR (400 LEVEL) FIRST SEMESTER

COURSE CODE	COURSE TITLE	UNITS
ENG 418	Computational Methods in Engineering	3
ABE 412	Agro-Resources Structures and Environmental Control	3
ABE 413	Directed Studies and Seminar	1
ABE 414	Engineering Hydraulics II	3
ABE 415	Engineering Properties and Handling of Biomaterials	3
ABE 416	Irrigation and Drainage Principles	3
ABE 417	Field Operations and Management of Farm Power& Machinery	3
ABE 418	Soil and Water Conservation Engineering	3
GNT 411	Practicum	2
	Total Units	**24**
*ABE 411	Farm Tractor Operation and Maintenance	2

*Service Course to B. Agric. Programme

FOURTH YEAR (400 LEVEL) SECOND SEMESTER

COURSE CODE	COURSE TITLE	UNITS
ENG 400	Students Industrial Work Experience Scheme	15

FINAL YEAR (500 LEVEL) FIRST SEMESTER

A. CORE COURSES

COURSE CODE	COURSE TITLE	UNITS
ABE 511	Bush Clearing and Land Development	2
ABE 512	Agro-Resources Power and Machinery Systems Management	2
ABE 513	Principles of Agro-Industrial Management and Business Law	3
ABE 500	Final Year Project	3
	Total Units	**10**

B. OPTIONAL COURSES

(i) Bioprocess and Food Engineering Option (BFE)

COURSE CODE	COURSE TITLE	UNITS
BFE 511	Food Engineering	3
BFE 512	Biomass Engineering	2
BFE 513	Solar Energy Applications in Bioprocess Engineering	2
BFE 514	Processing and Storage of Agro-Resources Products	3
	Total Units	**10**

(ii) Soil & Water and Aquacultural Engineering Option (SAE)

COURSE CODE	COURSE TITLE	UNITS
SAE 511	Design of Irrigation Systems	3
SAE 512	Rural Water Supply and Sanitation	3
SAE 513	Design of Irrigation and Soil Conservation Structures	3
SAE 514	Aquacultural Engineering	2
	Total Units	**11**

(iii)Agricultural and Bio-Resources Power and Machinery Engineering Option (APM)

COURSE CODE	COURSE TITLE	UNITS
APM 511	Agricultural and Bio-Resources Power	2
APM 512	Agro-Resources Machinery I	1
BFE 512	Biomass Engineering	2
BFE 513	Solar Energy Applications in Bioprocess Engineering	2
BFE 514	Processing and Storage of Agricultural Products	3
	Total Units	**10**

FINAL YEAR (500 LEVEL) SECOND SEMESTER

A. CORE COURSES

COURSE CODE	COURSE TITLE	UNITS
ABE 521	Design of Agro-Resources Machinery	2
ABE 522	Electrification and Alternative Energy Sources	3
ABE 523	Agro-Resources Transportation and Ergonomics	2
ABE 524	Agricultural and Bio-Resources Mechanization	2
ABE 525	Environmental Engineering	3

ABE 526	Foundation Engineering	3
ABE 500	Final year project	3
	Total Units	**18**

B. ELECTIVE COURSES

APM 521	Agro-Resources Machinery II	2
BPE 521	Mechanics of Deformable Bodies	2
BFE 522	Packaging and Containerization Engineering	2
SAE 521	Agricultural Land Drainage	2
	Total Units	**8**

3.9 Course Description and Learning Outcomes

ENG 111: Introduction to Engineering (1 Credits)

Course Learning Outcome

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

1. Explain the History and philosophy of science, Engineering and Technology:
2. Explain the origin and nature of man; man and his economic environment; scientific **and Learning Outcomes** methodology;
3. Describe science and technology in the society and service of man.
4. Identify Renewable and non-renewable resources; Man and his energy resources.
5. Highlight the Environmental effects of chemicals, plastics, textiles, wastes and other materials. Chemical and radio-chemical hazards.
6. Identify the various areas of science and technology

Course content

History and philosophy of science, Engineering and Technology: Man-his origin and nature; man and his economic 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 chemicals, plastics, textiles, wastes and other materials. Chemical and radio-chemical hazards. Introduction to the various areas of science and technology

MTH 112: Elementary Mathematics I (3 Credits)

Course Learning Outcome

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

1. Solve problems in Elementary set theory:
2. Explain and solve problems involving subsets, union, intersection, compliments, Venn diagrams.
3. Explain and solve problems involving Real numbers, integers, rational and irrational numbers; mathematical induction, real sequences and series;
4. Explain and solve problems involving theory of quadratic equations and binomial theorem.
5. Explain and solve problems involving Complex numbers; algebra of complex numbers, the Argand Diagram. De Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles, trigonometric identities, addition and factor formulae.
6. Handle General solution of trigonometric equations such as $aCos\phi + bSin\phi = c$. Matrices: Introduction to matrices, elementary operations on matrices, determinants of at most *3 x 3* matrices.

Course content

Elementary set theory: subsets, union, intersection, compliments, Venn diagrams. Real numbers, integers, rational and irrational numbers; mathematical induction, real sequences and series; theory of quadratic equations; binomial theorem. Complex numbers; algebra of complex numbers, the Argand Diagram. De Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles, trigonometric identities, addition and factor formulae. General solution of trigonometric equations such as $aCos\phi + bSin\phi = c$. Matrices: Introduction to matrices, elementary operations on matrices, determinants of at most *3 x 3* matrices.

PHY 111: General Physics I (Mechanics And Properties of Matter) (2 Credits)

Course Learning Outcome

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

1. Explain the Relevance of physics to Agriculture,
2. Describe Fundamental and Derived Units, Dimensions, vectors; addition and subtraction of vectors.
3. Solve problems involving vectors, scalar and vector products. Equilibrium.

4. Discuss the principle of moments, centre of gravity and its applications in agriculture.
5. Kinematics: displacement, velocity and acceleration. Projectile motion, circular motion, simple Harmonic motion. Dynamics;
6. State and explain Newton's laws of mechanics, Elastic and inelastic collision, modulus of elasticity; statics friction, inertia, moment of inertia and torque, properties of matter,
7. Describe the Archimedes principle, fluid pressure, blood pressure.

Course Content

Relevance of physics to Agriculture, Fundamental and Derived Units, Dimensions, vectors; addition and subtraction of vectors. Resolution of vectors, scalar and vector products. Equilibrium. The principle of moments, centre of gravity and its applications in agriculture. Kinematics: displacement, velocity and acceleration. Projectile motion, circular motion, simple Harmonic motion. Dynamics; Newton's laws of mechanics, Elastic and inelastic collision, modulus of elasticity; statics friction, inertia, moment of inertia and torque, properties of matter, Archimedes principle, fluid pressure, blood pressure.

PHY 112: Elementary Physics I (2 Credits)

Course Learning Outcome

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

1. Describe Space and Time, units and dimensions, frames of reference and Kinematics,,
2. State and explain the Fundamental laws of mechanics, statics and dynamics, work and energy, conservation laws and Galilean Invariance,
3. Explain Universal gravitation, rotational dynamics and angular momentum.
4. Describe Molecular treatment of properties of matter, elasticity, Hooke's law and Young's shear and bulk moduli,
5. Explain Hydrostatics, Pressure, buoyancy, Archimedes' principle, hydro-dynamics; streamlines,
6. State and explain Bernoulli and continuity equations, turbulence, Reynold's number, laminar flow, Poiseuile's equations,
7. Explain Surface tension, adhesion cohesion, capillarity, drops and bubbles, temperature; zeroth law of thermodynamics, heat laws of thermodynamics, gas laws, kinetic theory of gases, applications.

Course content

Space and Time, units and dimensions, frames of reference, Kinematics, Fundamental laws of mechanics, statics and dynamics, work and energy, conservation laws, Galilean Invariance, Universal gravitation, rotational dynamics and angular momentum. Molecular treatment of properties of matter, elasticity, Hooke's law, Young's shear and bulk moduli, Hydrostatics, Pressure, buoyancy, Archimedes' principle, hydro-dynamics; streamlines, Bernoulli and continuity equations, turbulence, Reynold's number, laminar flow, Poiseuile's equations, Surface tension, adhesion cohesion, capillarity, drops and bubbles, temperature; zeroth law of thermodynamics, heat laws of thermodynamics, gas laws, kinetic theory of gases, applications.

PHY 117: General Physics Laboratory I (1 Credit)

Course Learning Outcome

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

1. Elucidate the Relevance of physics to agriculture,
2. Describe fundamental and derived Credits, dimensions, vectors; addition & subtractions of vectors, resolution of vectors, scalar & vector products.
3. Explain Equilibrium, the principle of moments, centre of gravity and its application in agriculture,
4. Describe kinematics displacement, velocity and acceleration, projectile motion, circular motion, simple harmonic motion.
5. Explain Dynamics; elasticity; statics, friction, inertia, moment of inertia and torque, properties of matter,
6. State and explain Archimedes principle fluid pressure, blood pressure.

Course content

Relevance of physics to agriculture, fundamental and derived Credits, dimensions, vectors; addition & subtractions of vectors, resolution of vectors, scalar & vector products. Equilibrium, the principle of moments, centre of gravity and its application in agriculture, kinematics displacement, velocity and acceleration, projectile motion, circular motion, simple harmonic motion. Dynamics; elasticity; statics, friction, inertia, moment of inertia and torque, properties of matter, Archimedes principle fluid pressure, blood pressure.

CHM 113: General Chemistry I (3 Credits)

Course Learning Outcome

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

1. State and explain the Basic principles of matter and energy from the chemist's point of view:
2. Explain the atomic theory and molecular structure, stoichemistry, and the periodic classification of the elements,
3. Explain the atomic structure, chemical bonding, properties of gases, solids, liquids and solutions,
4. Describe chemical equilibrium, ionic equilibrium, chemical thermodynamics,
5. Explain the electro-chemistry and chemical kinetics (includes laboratory sessions).

Course content

Basic principles of matter and energy from the chemist's point of view: atomic theory and molecular structure, stoichemistry, the periodic classification of the elements, atomic structure, chemical bonding, properties of gases, solids, liquids and solutions, chemical equilibrium, ionic equilibrium, chemical thermodynamics, electro-chemistry and chemical kinetics (includes laboratory sessions).

CHM 114: Practical Chemistry I (1 Credit)

Laboratory exercises drawn from CHM 113.

GSS 111: Use of English I (2 Credits)

Course Learning Outcome

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

1. Listen understand comprehension: note taking during lectures, note taking from audio-visual equipment, concentration signals and cues as aids to listening comprehension.
2. Explain Phonetics and the use of the Library and Basic Research Methods:
3. Identify the types of Libraries, forms of Library services, cataloguing and book classification schemes, process of data collection/analysis,
4. Understand research writing process and technique, documentation, references, notes and bibliography, abbreviations in research writing,

5. Present the finished research report. Reading comprehension: the outline note, summary writing, genre and techniques of reading comprehension: scanning, skimming, intensive/extensive reading, word/text attack skills,
6. Explain the SQ3R techniques, varieties of English and Levels of Usage, vocabulary development: word choice and usage denotation and connotation. Term paper writing and submission.

Course content

Listening comprehension: note taking during lectures, note taking from audio-visual equipment, concentration signals and cues as aids to listening comprehension. Phonetics. The use of the Library and Basic Research Methods: Types of Libraries, forms of Library services, cataloguing and book classification schemes, process of data collection/analysis, research writing, process and technique, documentation, references, notes and bibliography, abbreviations in research writing, the finished research report. Reading comprehension: the outline note, summary writing, genre and techniques of reading comprehension: scanning, skimming, intensive/extensive reading, word/text attack skills, SQ3R techniques, varieties of English and Levels of Usage, vocabulary development: word choice and usage denotation and connotation. Term paper writing and submission.

GSS 112: Nigerian History (2 Credits)

Course Learning Outcome

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

1. Describe the concept of culture, pre-colonial cultures and languages of Nigeria.
2. Explain the Principles of kinship.
3. Explicate Descent and marriage in Nigerian cultures.
4. Explain the Nigerian economic institutions, Nigerian political institutions. Education and development in Nigeria. Religion in Nigerian culture.
5. Describe Culture, environment and health practices in Nigeria.

Course content

The concept of culture, pre-colonial cultures and languages of Nigeria. Principles of kinship. Descent and marriage in Nigerian cultures. Nigerian economic institutions, Nigerian political

institutions. Education and development in Nigeria. Religion in Nigerian culture. Culture, environment and health practices in Nigeria.

GSS 114: Elementary French 1 (1 Credit)

Course Learning Outcome

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

1. Explain the Introduction au pays La FRANCE et à [I]a language francaise.
2. Explain the Developpement de la langue à travers le monde. La Francophonie et les habitants des pays.
3. Describe Pourquoi le francais au Nigeria. La contribution de la France dans le développement de l'Agriculture, de la Science et de la Technologie. Les salutations quotidiennes et usuelles. Preséntation de soi et d'autrui: nom, profession,
4. adresse, et nationalité etc. Les professions dans le secteur agricole. Le personnel de l'université.. identification des gens et des objets communs. Les nombres car dinaux et ordinaux. S'orienter: trouver son chemin dans le campus.
5. Interrogation et negation a base des verbes les plus usages chaque jour.

Course Content

Introduction au pays La FRANCE et à [I]a language francaise. Developpement de la langue à travers le monde. La Francophonie et les habitants des pays. Pourquoi le francais au Nigeria. La contribution de la France dans le développement de l'Agriculture, de la Science et de la Technologie. Les salutations quotidiennes et usuelles. Preséntation de soi et d'autrui: nom, profession, adresse, et nationalité etc. Les professions dans le secteur agricole. Le personnel de l'université.. identification des gens et des objets communs. Les nombres car dinaux et ordinaux. S'orienter: trouver son chemin dans le campus. Interrogation et negation a base des verbes les plus usages chaque jour.

GSS 115: Basic German I (1Credit)

Course Learning Outcome

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

1. Pronounce alphabet (A, B, C, D, E, etc) vowels (A, E, I, O, U), Diphthongs (ai, ei, ou, eu, oi, ui) and consonants (b, c, d,).

2. Differentiate verbs int: Starke, schwache, and Hilfsverb.
3. Conjugate verbs into presens, Imperfekt, Plusquam perfekt, Futur I, Futur II. Deklination of nouns (substantiv); Pronouns (Wir, Ich, du, sie, er, es, 1hr, Sie).
4. Know the use of definite and indefinite articles – der, die, das, ein, eine, and their declinations.
5. Know the use of betimmte and umbestimte Numerale, as well as Adjective and its comparison.
6. Know use of capital leters and its importance. Alltag usages-days of the week, season of the year, timing, the months.
7. Know the use of Negation –nicht. Interrogation-weiche, was, warum, wer; Hilfsverbs- sein, haben.

Course Content

Pronounciation of alphabet (A, B, C, D, E, etc) vowels (A, E, I, O, U), Diphthongs (ai, ei, ou, eu, oi, ui) and consonants (b, c, d,). Differentiation of verbs int: Starke, schwache, and Hilfsverb. Conjugation of verbs into presens, Imperfekt, Plusquam perfekt, Futur I, Futur II. Deklination of nouns (substantiv); Pronouns (Wir, Ich, du, sie, er, es, 1hr, Sie). The usə of definite and indefinite articles – der, die, das, ein, eine, and their declinations. The use of betimmte and umbestimte Numerale, as well as Adjective and its comparison. Use of capital leters and its importance. Alltag usages-days of the week, season of the year, timing, the months. The use of Negation –nicht. Interrogation-weiche, was, warum, wer; Hilfsverbs- sein, haben.

GSS 116: Use of Library (1 Credit)

Course Learning Outcome

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

1. Explain History of libraries, Library and Education,
2. Identify the types of Libraries (university libraries), study skills (Reference Services), types of library materials,
3. Understand the use of library resources (including e-learing, e-materials, etc).
4. Understand library catalogues (Card, OPAC, etc,) and classification,
5. Explain Copyright and its Implications,
6. Explain Database Resources, Bibliography citation and referencing, Plagiarism.

Course Content

History of libraries, Library and Education, Types of Libraries (university libraries), study skills (Reference Services), types of library materials, using library resources (including e-learing, e-materials, etc) Understanding library catalogues (Card, OPAC, etc,) and classification, Copyright and its Implications, Database Resources, Bibliography citation and referencing, Plagiarism.

UGC 111: Farm Practice (1 Credit)

Course Learning Outcome

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

1. Know theIntroductory practical farming covering all fields of agriculture with emphases on farm planning and structure,
2. Understand site selection
3. Know the layout of a farm structures, roads and fences; field layout.

Course Content

Introductory practical farming covering all fields of agriculture with emphases on farm planning and structure, site selection's layout of a farm structures, roads and fences; field layout.

MTH 122: Elementary Mathematics II (3 Credits)

Course Learning Outcome

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

1. Understand Functions: concept and notation. Polynomial and rational functions.
2. Explain and solve problems involving Trigonometric, exponential, and logarithmic functions.
3. Explain Limit and have the idea of continuity. The derivative as limit of rate of change.
4. Know Differentiation of algebraic, trigonometric, exponential and logarithmic functions. Techniques of differentiation.
5. Know the Application to curve sketching, maxima and minima, etc. Integration as inverse of differentiation.
6. Solve problems of Definite and indefinite integrals. Methods of integration (substitution, partial fractions, parts). Application to geometry and mechanics.

Course Content

Functions: concept and notation. Polynomial and rational functions. Trigonometric, exponential, and logarithmic functions. Limit and the idea of continuity. The derivative as limit of rate of change. Differentiation of algebraic, trigonometric, exponential and logarithmic functions. Techniques of differentiation. Application to curve sketching, maxima and minima, etc. Integration as inverse of differentiation. Definite and indefinite integrals. Methods of integration (substitution, partial fractions, parts). Application to geometry and mechanics.

MTH 123: Introduction to Vectors (2 Credits)

Course Learning Outcome

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

1. Solve Equations of straight lines, circles, ellipse, parabola and hyperbola.
2. Understand Tangents and normals.
3. Explain Vectors, laws of vector algebra.
4. Know the Representation of vectors in 1-3 dimensions. Components, and direction cosines.
5. Know the Addition of vectors, and multiplication of a vector by a scalar.
6. Solve Scalar and vector products of two vectors, triple products, vector equation of a straight line and plane.

Course content

Equations of straight lines, circles, ellipse, parabola and hyperbola. Tangents and normals. Vectors, laws of vector algebra. Representation of vectors in 1-3 dimensions. Components, and direction cosines. Addition of vectors, and multiplication of a vector by a scalar. Scalar and vector products of two vectors, triple products, vector equation of a straight line and plane.

PHY 121: General Physics II (2 Credits)

Course Learning Outcome

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

1. Describe Waves; Dynamics of waves. The wave equation, characteristics of waves, stationary waves. Light waves and its characteristics.
2. Explain Imaging, sound wave. Doppler effects. The converging lens. Refraction at plane surfaces.
3. Explain Electricity; electrostatic force. Coulomb's law, electric field and electric potential.

4. State and explain Ohm's law, Alternating current, Magnetism; magnetic effects of currents.
5. Explain Permanent magnetism, Ferro-magnetism. Faraday's laws of induction.
6. Describe the potentiometer and the white stone bridge. Concept of heat. Temperature and thermometers.

Course content

Waves; Dynamics of waves. The wave equation, characteristics of waves, stationary waves. Light waves and its characteristics. Imaging, sound wave. Doppler effects. The converging lens. Refraction at plane surfaces. Electricity; electrostatic force. Coulomb's law, electric field and electric potential. Ohm's law, Alternating current, Magnetism; magnetic effects of currents. Permanent magnetism, Ferro-magnetism. Faraday's laws of induction. The potentiometer and the white stone bridge. Concept of heat. Temperature and thermometers.

PHY 122: Elementary Physics II (2 Credits)

Course Learning Outcome

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

1. Explain Electrostatics, conductors and currents; dielectrics,
2. Explain magnetic field and induction;
3. State Maxwell's equations;
4. Explain Electromagnetic oscillations and waves applications.

Course Content

Electrostatics, conductors and currents; dielectrics, magnetic field and induction; Maxwell's equations; Electromagnetic oscillations and waves; applications.

PHY 127: Physics Laboratory II (1 Credit)

Course Learning Outcome

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

1. Explain quantitative measurements, the treatment of measurement errors and graphical analysis.
2. Apply the variety of experimental techniques.

3. Understand the experiments including studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems,
4. Explain light and heat energy
5. Explain viscosity.

Course content

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques will be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity.

CHM 121: General Chemistry II (3 Credits)

Course Learning Outcome

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

1. Know the application of the principles of chemical and physical change to the study of the behaviour of matter and the interaction between matters.
2. Understand the chemistry of representative elements and their common compounds with emphasis on gradation of their properties.
3. Explain the chemistry of the first series of transition elements,
4. Know the general principles of extraction of metals;
5. Understand introductory nuclear chemistry (includes Lab Sessions).

Course Content

Application of the principles of chemical and physical change to the study of the behaviour of matter and the interaction between matters. Course content includes, the chemistry of representative elements and their common compounds with emphasis on gradation of their properties – brief chemistry of the first series of transition elements, general principles of extraction of metals; introductory nuclear chemistry (includes Lab Sessions).

CHM 124: Practical Chemistry II (1 Credit)

Course Learning Outcome

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

1. Explain the theory and practice of simple volumetric and qualitative analyses,
2. Describe simple organic preparations,
3. Explain the reactions of functional groups and physical determinations.

Course content

The theory and practice of simple volumetric and qualitative analyses, simple organic preparations, reactions of functional groups and physical determinations.

GSS 121: Use of English II (Basic Grammar & Varieties Of Writing) (2 Credits)

Course Learning Outcome

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

1. Study and discuss a recommended novel.
2. Know the Basic Grammar: Sentence elements, sentence types and varieties,
3. Understand punctuation and capitalization, abbreviation in sentence construction, homonyms, synonyms, antonyms and acronyms, error identification and correction.
4. Know the Writing Skills and varieties of writing: the paragraph – devices of coherence/logical connectors,
5. Identify the types of writing – narration, description, exposition, and argumentation.

Course content

Each student is required to study a recommended novel. Basic Grammar: Sentence elements, sentence types and varieties, punctuation and capitalization, abbreviation in sentence construction, homonyms, synonyms, antonyms and acronyms, error identification and correction. Writing Skills and varieties of writing: the paragraph – devices of coherence/logical connectors, types of writing – narration, description, exposition, and argumentation.

GSS 124: Elementary French II (1 Credit)

Course Learning Outcome

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

1. Explain Les jours de la semaine, les mois de l'anneé, la date.
2. Describe Description physiques et psychologiques de soi et des autres personnes Quelle heure est-il?
3. Understand Description de la vie et des activities quotitienness; interrogation et negation.
4. Explain L'alphabet francsais et l' orthographe, introduction à la dictée.
5. Explain Les adjectives possessifs, Le corps humain. A l'hôpital. En ville: à la poste, au marché, à lagare, à la biblionthéque etc. Les autres moyens de transport. La famille, les vétements et les couleurs.

Course Content

Les jours de la semaine, les mois de l'anneé, la date. Description physiques et psychologiques de soi et des autres personnes Quelle heure est-il? Description de la vie et des activities quotitienness; interrogation et negation. L'alphabet francsais et l' orthographe, introduction à la dictée. Les adjectives possessifs, Le corps humain. A l'hôpital. En ville: à la poste, au marché, à lagare, à la biblionthéque etc. Les autres moyens de transport. La famille, les vétements et les couleurs.

GSS 125: Basic German II (1 Credit)

Course Learning Outcome

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

1. Know Saiziehre (Sentence Construction):
2. Understand definition of sentences, art and form of German sentences, Das Saizghid.
3. Know the Use of Surfix and Prefix;
4. Know the Use of big and small letters in sentences;
5. Know the Conjugation of verbs.

Course content

Saiziehre (Sentence Construction): definition of sentences, art and form of German sentences, Das Saizghid. Use of Surfix and Prefix; Use of big and small letters in sentences; Conjugation of verbs.

GSS 126: Social Science (2 Credits)

Course Learning Outcome

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

1. Explain the global perspective of economics, institutions and developments.
2. Explain the law of scarcity and the technological choices open to any society.
3. Describe the Trade development with special reference to trade in primary products, imports substitution and export possibilities in Nigeria and Third World countries;
4. Explain Nigeria's balance of payments and commercial policies. Economic integration or unions.
5. Discuss the State and structure of economics of ECOWAS countries. Nigerian and ECOWAS;
6. Know the prospects for industrialization, trade; fiscal and monetary policies for accelerated industrialization. Nigeria and the Economic Co-operation in Africa (ECA).

Course content

A global perspective of economics, institutions and developments. The law of scarcity and the technological choices open to any society. Trade development with special reference to trade in primary products, imports substitution and export possibilities in Nigeria and Third World countries; Nigeria's balance of payments and commercial policies. Economic integration or unions. State and structure of economics of ECOWAS countries. Nigerian and ECOWAS; prospects for industrialization, trade; fiscal and monetary policies for accelerated industrialization. Nigeria and the Economic Co-operation in Africa (ECA).

ENG 121: Computer Applications and Information Technology (2 Credits)

Course Learning Outcome

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

1. Present the overview of Computer Application ;
2. Explain Data processing Application and Computations involving Microsoft Excel (Spreadsheet); involving Microsoft power point;
3. Know Introduction to computer power point application and software;
4. Understand the Use of computer software for solving mathematical problems.

5. Know the Management information system and Networks: information Technology; Network and securities etc.

Course Content

Computer Application overview; Data processing Application and Computations involving Microsoft Excel (Spreadsheet); involving Microsoft power point; Introduction to computer power point application and software; Use of computer software for solving mathematical problems. Management information system and Networks: information Technology; Network and securities etc.

ENG 211: Engineering Thermodynamics I (3 Credits)

Course Learning Outcome

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

1. Identify and explain Thermodynamic properties, energy relations and conservation. Paths and processes.
2. Explain Cycle analysis, reversibility.
3. State the first law and second law of thermodynamics, entropy. Irreversibility and availability.
4. Explain Air-standard cycles, power and efficiencies.
5. Explain the steady state flow equation (Bernouli Equation) and application. Masses.
6. Explain Elements of vibrated systems. Force and motion relationship in constrained mechanisms.

Course Content

Thermodynamic properties, energy relations and conservation. Paths and processes. Cycle analysis, reversibility. The first law and second law of thermodynamics, entropy. Irreversibility and availability. Air-standard cycles, power and efficiencies. The steady state flow equation (Bernouli Equation) and application. Masses. Elements of vibrated systems. Force and motion relationship in constrained mechanisms.

ENG 212: Workshop Technology/Practice I (2 Credits)

Course Learning Outcome

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

1. Explain Industrial safety: safety code of conduct and safety consciousness.

2. Identify common sources of accidents in the work place. Accident prevention and control.
3. Know the use of engineering measuring instruments: Calipers, gauges. Sheet metal work-layout and Blacksmiting hand tool, cutting, shaping, welding, brazing, soldering, bolting and riverting and working principles. Joints and fastenings:
4. Explain Woodwork and Basic woodworking principle and tools. Types of joints, processing of timber.
5. Know the Introduction to Industrial bolting and riveting. Safety: survey of sources of common accidents, accident prevention and control.
6. Explain the Introduction to machine shop: lathe work: shaping, milling and grinding,
7. Know the Electrical workshop practice: convention and application of colour, codes for cables, resistors, etc and signs.
8. Explain the Use of simple electrical tools, machines, etc. Measurement and marking : for Uniformity, circulatory, concentricity, etc.

Course Content

Industrial safety: safety code of conduct and safety consciousness. Survey of common sources of accidents in the work place. Accident prevention and control. Use of engineering measuring instruments: Calipers, gauges. Sheet metal work-layout and Blacksmiting handtool, cutting, shaping, welding, brazing, soldering, bolting and riverting and working principles. Joints and fastenings: Woodwork: Basic woodworking principle and tools. Types of joints, processing of timber. Introduction to Industrial bolting and riveting. Safety: survey of sources of common accidents, accident prevention and control. Introduction to machine shop: lathe work: shaping, milling and grinding, Electrical workshop practice: convention and application of colour, codes for cables, resistors, etc and signs. Use of simple electrical tools, machines, etc. Measurement and marking: for Uniformity, circulatory, concentricity, etc.

ENG 213: Basic Electrical Engineering (3 Credits)

Course Learning Outcome

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

1. Know the SI System of unit, E.S. and Fm Fields: Electric field intensity, potential and potential Difference,

2. Explain Magnetic field intensity, flux density, Magnetic circuits, and inductors. Dc circuit Analysis:
3. State the Kirchoff's Law, Mesh and Nodal Equations, superposition Theorem.
4. Explain the venins Theorem, Norton's Theorem, Maximum power transfer, transients (RL and RC) circuits.
5. Explain A.C circuit Analysis: Alternating current, Voltage, frequency, phase angle,
6. Describe Maximum RMS and average values of waveforms, Inductive and capacitive reactance, Power in ac circuits,
7. Know the use of complex algebra in the solution of as circuits. Resonance.

Course Content

SI System of unit, E.S. and Fm Fields: Electric field intensity, potential and potential Difference, Magnetic field intensity, flux density, Magnetic circuits, inductors. Dc circuit Analysis: Kirchoff's Law, Mesh and Nodal Equations, superposition Theorem. Thevenins Theorem, Norton's Theorem, Maximum power transfer, transients (RL and RC) circuits .A.C circuit Analysis: Alternating current, Voltage, frequency, phase angle, Maximum RMS and average values of waveforms, Inductive and capacitive reactance, Power in ac circuits, use of complex algebra in the solution of as circuits. Resonance.

ENG 214: Engineering Drawing I (2 Credits)

Course Learning Outcome

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

1. Identify the Drawing instruments and the use of graphic tools.
2. Know the Introduction to drawing, measuring, lettering and dimensioning of objects in various views/positions.
3. Explain Engineering geometry. Projections: lines, planes and simple solids.
4. Explain the Fundamentals of orthographic projection, first and third angle orthogonal projections, isometric projections.
5. Know the Graphs, charts and presentation of data and results. Pictorial/freehand sketching. Graphical calculus and Applications.

Course Content

Drawing instruments and the use of graphic tools. Introduction to drawing, measuring, lettering and dimensioning of objects in various views/positions. Engineering geometry. Projections: lines, planes and simple solids. Fundamentals of orthographic projection, first and third angle orthogonal projections, isometric projections. Graphs, charts and presentation of data and results. Pictorial/freehand sketching. Graphical calculus and Applications.

ENG 215: Engineering Mechanics (3 Credits)

Course Learning Outcome

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

1. Explain Statics: Laws of statics; system of forces and their properties;
2. Solve Simple problems of statics
3. Explain Friction, Particle dynamics: Kinematics of plane motion.
4. State Newton's law -kinetics of particles, momentum and energy methods. Kinetics of Rigid Bodies: two-dimensional motion of rigid bodies, energy and momentum. Mass, movement of inertia. Simple problems.
5. Explain Simple harmonic motions. Concepts and types of mechanisms. Static and dynamic force analysis.

Course content

Statics: Laws of statics; system of forces and their properties; Simple problems. Friction, Particle dynamics: Kinematics of plane motion. Newton's law -kinetics of particles, momentum and energy methods. Kinetics of Rigid Bodies: two-dimensional motion of rigid bodies, energy and momentum. Mass, movement of inertia. Simple problems. Simple harmonic motions. Concepts and types of mechanisms. Static and dynamic force analysis.

MTH 211: Mathematical Methods I (3 Credits)

Course Learning Outcome

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

1. Explain Series and tests for convergence in infinite sequences and series of numbers.
2. Solve Equation of lines and planes.
3. Explain Matrices determinants, eigen values and eigen functions,

4. Know matrix solution of linear algebraic equations, dot and cross product of vectors, triple products, vector functions, the gradient, divergence and curl.
5. Explain and solve problems involving Vector spaces. Linear dependence and independence (Wronskians and Jacobians). Computer solution of matrices.

Course Content

Series and tests for convergence if infinite sequences and series of numbers. Equation of lines and planes. Matrices determinants, eigen values and eigen functions, matrix solution of linear algebraic equations, dot and cross product of vectors, triple products, vector functions, the gradient, divergence and curl. Vector spaces. Linear dependence and independence (Wronskians and Jacobians). Computer solution of matrices.

MTH 214: Linear Algebra I (2 Credits)

Course Learning Outcome

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

1. Explain Vector spaces over the real field. Subspaces.
2. Describe Linear independence, basis and dimension.
3. Solve problems involving Change of basis. Linear transformations and their representation by matrices.
4. Explain Range, null space and rank. Singular and non-singular transformations.
5. Explain and solve problems involving Algebra of matrices. Systems of linear equations.

Course Content

Vector spaces over the real field. Subspaces. Linear independence, basis and dimension. Change of basis. Linear transformations and their representation by matrices. Range, null space and rank. Singular and non-singular transformations. Algebra of matrices. Systems of linear equations.

GSS 212: Peace & Conflict Resolution Studies (2 Credits)

Course Learning Outcome

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

1. Know the basic concepts in peace and conflict resolution,
2. Explain peace as vehicle of unity and development, conflict issues,

3. Identify the types of conflicts e.g religious/ethnic/political/economic conflicts, type of conflicts and violence in Africa, indigenes/settlers phenomenon, peace-building, management of conflict and security.
4. Know the Elements of peace studies and conflict resolution. Dispute resolution (ADR), dialogue/ Arbitration in conflict resolution,
5. Highlight the roles of international organization in conflict resolution, e.g. Economic Community of West African State (ECOWAS) African Union, United Nations, communal/ indigenous conflicts, individual conflict, terrorism e.t.c.

Course content

This course focuses on basic concepts in peace and conflict resolution, peace as vehicle of unity and development, conflict issues, type of conflicts e.g religious/ethnic/political/economic conflicts, type of conflicts and violence in Africa, indigenes/settlers phenomenon, peace-building, management of conflict and security. Elements of peace studies and conflict resolution. Dispute resolution (ADR), dialogue/ Arbitration in conflict resolution, roles of international organization in conflict resolution, e.g. Economic Community of West African State (ECOWAS) African Union, United Nations, communal/ indigenous conflicts, individual conflict, terrorism e.t.c.

GSS 217: Philosophy and Logic (2 Credits)

Course Learning Outcome

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

1. Elucidate the overview of philosophy.
2. Define and state uses of philosophy.
3. Explain Philosophy and common sense; philosophy and myth; philosophy and religion;
4. Describe philosophy and science – empiricism.
5. Explain Metaphysics, ethics, epistemology, logic, existentialism.

Course Content

An overview of philosophy. Definition and uses of philosophy. Philosophy and common sense; philosophy and myth; philosophy and religion; philosophy and science – empiricism. Metaphysics, ethics, epistemology, logic, existentialism.

ENG 200: Student Work Experience Programme (SWEP I) (1 Credit)

ENG 221: Strength of Materials I (2 Credits)

Course Learning Outcome

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

1. Explain stress and strain; some simple states of stress and strain; stresses;
2. Know the relationship between loading shearing forces and bending moment; composite shafts and torsional strain energy.
3. Explain Deflection of beams, Macaulay's method, area moment method,
4. State Maxwell's reciprocal rule,
5. Explain built-in and continuous beam in various loading situations; Complex stress and strain,
6. Explain Mohr's stress circle, principal stress and strain, electric constant and volumetric strain;
7. Discuss St. Venant's theory; stress in composite materials, bending of plates; membranes. Stresses;
8. Explain stresses in thin cylinders and spheres; thermal stresses; stresses in rivets, joints, etc. use of strain gauge and other measuring devices.

Course Content

Introduction to stress and strain; some simple states of stress and strain; stresses; relationship between loading shearing forces and bending moment; composite shafts and torsional strain energy. Deflection of beams, Macaulay's method, area moment method, Maxwell's reciprocal rule, built-in and continuous beam in various loading situations; Complex stress and strain, Mohr's stress circle, principal stress and strain, electric constant and volumetric strain; St. Venant's theory; stress in composite materials, bending of plates; membranes. Stresses; stresses in thin cylinders and spheres; thermal stresses; stresses in rivets, joints, etc. use of strain gauge and other measuring devices.

ENG 222: Engineering Drawing II (2 Credits)

Course Learning Outcome

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

1. Explain the Projection of lines and laminae; auxiliary views and mixed projection.
2. Prepare detailed work in drawings for production; semi-detailed drawings, conventional presentation methods.
3. Assemble drawing of machines, devices and installation layout;
4. Explain itemization and part-listing.
5. Understand Drawing office practice and reprographics.
6. Know the Connections in Engineering Drawing.
7. Highlight the IS code of drawing. Conics and engineering curves – ellipse, parabola, hyperbola, cycloid, trochoid, involutes.
8. Understand the Projection of planes and solids (cube, prison, pyramid, cylinder, core and sphere.

Course Content

Projection of lines and laminae; auxiliary views and mixed projection. Preparation of detailed working drawings for production; semi-detailed drawings, conventional presentation methods. Assembly drawing of machines, devices and installation layout; itemization and part-listing. Drawing office practice and reprographics. Connections in Engineering Drawing. Introduction to IS code of drawing. Conics and engineering curves – ellipse, parabola, hyperbola, cycloid, trochoid, involutes. Projection of planes and solids (cube, prison, pyramid, cylinder, core and sphere.

ENG 223: Computer Programming (3 Credits)

Course Learning Outcome

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

1. Explain Computer, computing and engineering, algorithms flow chart and pseudo code.
2. Describe the Computer languages, programming in FORTRAN? Or later versions.
3. Explain the Debugging techniques. Computer code security. Laboratory:
4. Explain the hands-on experience on computers through the use of ‘Compilers to run programs’ and to solve simple analysis problems in fluid,

5. Explain the thermodynamics, heat transfer and electrical systems.

Course Content

Computer, computing and engineering, algorithms flow chart and pseudo code. Computer languages, programming in FORTRAN? Or later versions. Debugging techniques. Computer code security. Laboratory: hands-on experience on computers through the use of 'Compilers to run programs' and to solve simple analysis problems in fluid, the thermodynamics, heat transfer and electrical systems.

ENG 224: Materials Science (2 Credits)

Course Learning Outcome

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

1. Explain the Atomic and Molecular Structures, Crystals. Metallic States. Defects in Crystals, Conductors, Semi-conductors and Insulators.
2. Describe the Alloy theory – application to industrial alloys steel in particular. Engineering Properties – their control. hot and cold working, heat treatment, etc.
3. Explain the Principles of mechanical testing, impact test, tensile test, hardness tests, fatigue tests, creep test and non-destructive tests. Fracture. Corrosion and corrosion control.
4. Explain Equilibrium and rate reaction. Non-metallic materials – glass, rubber, concrete, plastics, wood and ceramic materials.
5. Explain the Electrical properties. Magnetic materials: properties and characteristics. Domia theory, magnetostic, anisotropy, losses, permanent magnets, transformers cores.
6. Identify and describe Electric materials: Liquid, solid and organic dielectrics polymers: properties/characteristics, inorganic materials, piezoelectric and ferro-electric materials, composite structures, conductors, superconductors and insulators.
7. Explain Reaction and Phase Equilibra: Reaction rate; Rate Laws. Mechanisms and theories of elementary processes; photo chemical reactions. Basic Electrochemistry.

Course Content

Atomic and Molecular Structures, Crystals. Metallic States. Defects in Crystals, Conductors, Semi-conductors and Insulators. Alloy theory – application to industrial alloys steel in particular. Engineering Properties – their control. hot and cold working, heat treatment, etc. Principles of mechanical testing, impact test, tensile test, hardness tests, fatigue tests, creep test and non-

destructive tests. Fracture. Corrosion and corrosion control. Equilibrium and rate reaction. Non-metallic materials – glass, rubber, concrete, plastics, wood and ceramic materials. Electrical properties. Magnetic materials: properties and characteristics. Domia theory, magnetostic, anisotropy, losses, permanent magnets, transformers cores. Electric materials: Liquid, solid and organic dielectrics polymers: properties/characteristics, inorganic materials, piezoelectric and ferro-electric materials, composite structures, conductors, superconductors and insulators. Reaction and Phase Equilibra: Reaction rate; Rate Laws. Mechanisms and theories of elementary processes; photo chemical reactions. Basic Electrochemistry.

ENG 225: Fluid Mechanics I (3 Credits)

Course Learning Outcome

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

1. Know the definition of a fluid and state fluid properties.
2. Explain Statics of fluid systems, pressure in a static fluid, momentary, forces on planes and curved surfaces.
3. Explain Kinematics of fluid motion, streamlines, velocity, acceleration, rotation and circulation. Buoyancy and floatation, stability of floating and submerged bodies. Types of flow, continuity equation, energy equation, momentum equation, fluid resistance, laminar and turbulent flow in fluids, flow in closed conduits boundary layer concepts.
4. Derive the Euler and Bernoulli equations.
5. Conduct the Differential analysis. Fluid measurements; pressure, velocity and flow rates.
6. Explain the Hydraulics of pipe flow; hydraulic and energy grade lines, pipes in series, parallel pipes, branching pipes, network of pipes, deterioration of pipes.
7. Explain the unsteady flow conduits, water hammer purge control.
8. Conduct the Laboratory Measurement of fluid properties, stability of floating bodies.

Course Content

Definition of a fluid and fluid properties. Statics of fluid systems, pressure in a static fluid, momentary, forces on planes and curved surfaces. Kinematics of fluid motion, streamlines, velocity, acceleration, rotation and circulation. Buoyancy and floatation, stability of floating and submerged bodies. Types of flow, continuity equation, energy equation, momentum equation, fluid resistance, laminar and turbulent flow in fluids, flow in closed conduits boundary layer concepts.

The Euler and Bernoulli equations. Differential analysis. Fluid measurements; pressure, velocity and flow rates. Hydraulics of pipe flow; hydraulic and energy grade lines, pipes in series, parallel pipes, branching pipes, network of pipes, deterioration of pipes. Unsteady flow conduits, water hammer purge control. Laboratory: Measurement of fluid properties, stability of floating bodies.

ENG 226: Engineer in Society (1 Credit)

Course Learning Outcome

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

1. Explain the Philosophy of science.
2. Describe the History of Engineering and Technology.
3. Identify the Safety in Engineering and conduct Risk Analysis.
4. Discuss the Role of Engineers in Nation Building. .

Course Content

Philosophy of science. History of Engineering and Technology. Safety in Engineering and Introduction to Risk Analysis. The Role of Engineers in Nation Building. Invited Lectures from professionals.

MTH 221: Mathematical Methods II (3 Credits)

Course Learning Outcome

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

1. Elucidate the Review of differentiation and integration methods. Derivation of equations from physics, chemistry, biology, geometry etc.
2. Solve Ordinary differential equations.
3. Know the Applications of first order differential equations. Second order linear equations. Linear dependence and independence.
4. Know the Solutions of second order linear differential equations by method of undetermined coefficients and variation of parameters.
5. Solve problems of Simple Laplace transformation. Solution of initial-value problems by Laplace transform method.

6. Know the Computer solution of selected engineering problems. Excel package. Double and triple integrals with applications, vector integration and vector integral theorems: divergence
7. Explain and solve problems associated with Green's - Stoke's theorems and applications. Functions of more than one variable. Extremization of functions of many variables.

Course Content

Review of differentiation and integration methods. Derivation of equations from physics, chemistry, biology, geometry etc. Ordinary differential equations. Applications of first order differential equations. Second order linear equations. Linear dependence and independence. Solutions of second order linear differential equations by method of undetermined coefficients and variation of parameters. Simple Laplace transformation. Solution of initial-value problems by Laplace transform method. Computer solution of selected engineering problems. Excel package. Double and triple integrals with applications, vector integration and vector integral theorems: divergence Green's - Stoke's theorems and applications. Functions of more than one variable. Extremization of functions of many variables.

STA 224: Statistics For Physical Science & Engineering (3 Credits)

Course Learning Outcome

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

1. Explain Distributions: Binomial, Poisson,
2. Explain and solve problems of Geometric and Hypergeometric.
3. Explain Continuous probability distributions:
4. Apply the Normal, students t, chi-square (x) and F in solving statistical problems.

Course Content

Distributions: Binomial, Poisson, Geometric and Hypergeometric. Continuous probability distributions: Normal, students t, chi-square (x) and F

GNT 221: Entrepreneurship Studies (2 Credits)

Course Learning Outcome

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

1. Identify the Basic Engineering Business Settings: -
2. Review engineering business activities.

3. Elucidate Introduction to organizational structure of manufacturing organization.
4. Explain Entrepreneurship and new Venture creation:- Evolution of an industrial, domestic and commercial products to meet the need of the society.
5. Draw Bill of Quantities.
6. Identify materials- material location, quantity, quality and handling requirements, specification. Quality control and measurement.
7. Carry out Cost estimation and marketing of products: market/product mix, market research and market strategy. Group technology task.

Course Content

Basic Engineering Business Settings: - Review of engineering business activities. Introduction to organizational structure of manufacturing organization. Entrepreneurship and new Venture creation:- Evolution of an industrial, domestic and commercial products to meet the need of the society. Drawing, Bill of Quantities. Identification of materials- material location, quantity, quality and handling requirements, specification. Quality control and measurement. Cost estimation and marketing of products: market/product mix, market research and market strategy. Group technology task.

ABE 221: Agricultural And Bioresources Engineering Concepts (1 Credit)

Course Learning Outcome

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

1. Explain Agricultural Engineering profession. Areas of specialization in agricultural and bioresources engineering.
2. Explain the Nigerian Institution of Agricultural Engineers (history, grades, organization, qualification for membership, funding, publications, conferences, achievements, challenges etc.).
3. Explain the role of agricultural engineering in national development.
4. Know the Relationship between The Nigerian Institution of Agricultural Engineers and The Nigerian Society of Engineers.
5. Identify the various tractors and implements and component parts (makes and models).

6. Explain the Concept of irrigation and soil and water conservation. Irrigation types. Unit Operations in agro-processing.

Course Content

Introduction of Agricultural Engineering profession. Areas of specialization in agricultural and bioresources engineering. The Nigerian Institution of Agricultural Engineers (history, grades, organization, qualification for membership, funding, publications, conferences, achievements, challenges etc.). The role of agricultural engineering in national development. Relationship between The Nigerian Institution of Agricultural Engineers and The Nigerian Society of Engineers. Identification of various tractors and implements and component parts (makes and models). Concept of irrigation and soil and water conservation. Irrigation types. Unit Operations in agro-processing.

ENG 311: Engineering Economics (2 Credits)

Course Learning Outcome

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

1. Explain the Basic economic concepts.
2. Identify and explain the Factors of production.
3. Explain Supply and demand. Price elasticity analysis.
4. Describe Household behavior theories. Business organization. Production, the market, income employment – classical, non-classical and Keynesian approaches.
5. Explain Money, Expenditure, Taxation, Budget, International trade. Cost analysis. Fixed and variable costs; Depreciation, capital cost. Cost recovery factor. Breakeven analysis.

Course Content

Basic economic concepts. Factors of production. Supply and demand. Price elasticity analysis. Household behavior theories. Business organization. Production, the market, income employment – classical, non-classical and Keynesian approaches. Money, Expenditure, Taxation, Budget, International trade. Cost analysis. Fixed and variable costs; Depreciation, capital cost. Cost recovery factor. Breakeven analysis.

ENG 313: Engineering Analysis (3 Credits)

Course Learning Outcome

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

1. Explain Complex derivatives and analytical functions. Bilinear transformation, conformal mapping, contour integration,
2. State Cauchy's integral theory, residue theorem, applications and Riemans surfaces.
3. Know Special functions, Bessels equation, fourier series and lengendre functions.
4. Solve problems involving Simultaneous differential equations with constant coefficients;
5. Solve Laplace transforms methods. Linear second order differential equations with constant and variable coefficients classification of second order partial differential equations:- Laplace, wave & diffusion equations, initials and boundary value problems, separation of variables, similarity solutions.
6. Handle Solution of equations by iteration. Newton-Raphson Method; errors. Numerical differentiation and integration, Simpson's rule.
7. Solve problems of interpolation and curve fittings.
8. Conduct Statistical Analysis as Regression and correlation – large sampling theory, Test Hypothesis and Quality Control. Introduction to system modeling.

Course content

Complex derivatives and analytical functions. Bilinear transformation, conformal mapping, contour integration, Cauchy's integral theory, residue theorem, applications and Riemans surfaces. Special functions, Bessels equation, fourier series and lengendre functions. Simultaneous differential equations with constant coefficients; Laplace transforms methods. Linear second order differential equations with constant and variable coefficients classification of second order partial differential equations:- Laplace, wave & diffusion equations, initials and boundary value problems, separation of variables, similarity solutions. Solution of equations by iteration. Newton-Raphson Method; errors. Numerical differentiation and integration, Simpson's rule. Introduction to interpolation and curve fittings. Statistical Analysis; Regression and correlation – large sampling theory, Test Hypothesis and Quality Control. Introduction to system modeling.

ABE 311: Engineering Hydraulics I (2 Credits)

Course Learning Outcome

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

1. Identify Fluid properties, fluid statics.
2. Explain Fluid motion, continuity, Bernoulli, energy momentum equations.
3. State the Reynolds number
4. Explain Laminar and turbulent flow pipe flow.
5. Describe Open channel flow. Weirs, flumes, pumps, turbines, outlets, gates, valves.

Course content

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

ABE 312: Soil Mechanics II (2 Credits)

Course Learning Outcome

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

1. Elucidate the Introduction to soil mechanics.
2. Explain Phase relationship, Permeability Consolidation,
3. Explain Seepage.
4. Explain Effective stress principle. Stress distribution in soils. Site investigation
5. Explain Machine soil relationship. Failure forces due to small rake angles. Two and Three dimensional soil failures

Course Content

Introduction to soil mechanics. Phase relationship, Permeability Consolidation, Seepage and analysis. Effective stress principle. Stress distribution in soils. Site investigation Machine soil relationship. Failure forces due to small rake angles. Two and Three dimensional soil failures

ABE 314*: Introduction to Agro-Resources Engineering and Drawing (2 Credits)

ABE 315: Automotive Services and Maintenance (2 Credits)

Services and maintenance of all the components of an automobile

SSA 311: Introduction to Soil Science and Soil Tillage (2 Credits)

Course Learning Outcome

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

1. Explain the Origin and formation of soils.
2. Identify and explain the Physical properties of soil.
3. Explain the Soil colloids; soil reaction; soil survey and classification.
4. Explain the Water movement in soils, Soil mineralogy, soil organic matter. Fertilizers. Soil components.
5. Explain Soil consistency. Hardness. Friability. Plasticity. Soil aeration.
6. Explain concepts of Tillage types. Benefits and justifications for mechanized tillage in the tropics. Design of tillage experiments.

Course content

Origin and formation of soils. Physical properties of soil. Soil colloids; soil reaction; soil survey and classification. Water movement in soils, Soil mineralogy, soil organic matter. Fertilizers. Soil components. Soil consistency. Hardness. Friability. Plasticity. Soil aeration. Tillage concepts,Tillage types. Benefits and justifications for mechanized tillage in the tropics. Design of tillage experiments.

EME 311: Mechanics of Machines I (2 Credits)

Course Learning Outcome

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

1. Explain the Concept and types of mechanisms. Kinematics of mechanisms, kinematic analysis. Complete static and dynamic forces and analysis.
2. Explain Flexible shaft couplings, virtual work, energy and speed fluctuations in machines.
3. Identify the flywheel and mechanical governors. Acceleration of geared systems, equilibrium of machines, brakes and dynamometers mechanisms.
4. Explain Spiral gearing and theory of involute gearing, simple, compound and epicyclic gear trains. Dynamics of rotating and reciprocating machines, static and dynamic balancing of machines. Balancing of rotating masses, multi-cylinder engines and governors.

5. Explain Friction, wear and lubrication-application in kinematics and selection of power screws, bolt and rope drives. Chains, brakes and clutches, hydrodynamic and hydrostatic lubrications, journal bearings,
6. State Reynolds equation, project graphical solutions,
7. Explain oil and gas bearings, Hydrodynamic drives, torque converters.

Course Content

Concept and types of mechanisms. Kinematics of mechanisms, kinematic analysis. Complete static and dynamic forces and analysis. Flexible shaft couplings, virtual work, energy and speed fluctuations in machines. The flywheel and mechanical governors. Acceleration of geared systems, equilibrium of machines, brakes and dynamometers mechanisms. Spiral gearing and theory of involute gearing, simple, compound and epicyclic gear trains. Dynamics of rotating and reciprocating machines, static and dynamic balancing of machines. Balancing of rotating masses, multi-cylinder engines and governors. Friction, wear and lubrication-application in kinematics and selection of power screws, bolt and rope drives. Chains, brakes and clutches, hydrodynamic and hydrostatic lubrications, journal bearings, Reynolds equation, graphical solutions, oil and gas bearings, Hydrodynamic drives, torque converters.

EME 315: Strength of Material II (3 Credits)

Course Learning Outcome

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

1. Explain Complex stresses and strains. Two dimensional stress and strain analysis.
2. Explain the concepts of stress at appoint. Principal stress, principal strain,
3. State Hook's Law: torsional loading; shear forces and bending moments. Thick and thin walled cylindrical pressure vessels,
4. Explain Deflection under flexural loading, statically determinate and indeterminate structure shear flow, strain energy, failure theories, repeated loading and impact loading.
5. Conduct three dimensional stress and strain analysis.
6. Carry out Experimental stress analysis.

Course Content

Complex stresses and strains. Two dimensional stress and strain analysis. concepts of stress at appoint. Principal stress, principal strain, Hook's Law: torsional loading; shear forces and bending

moments. Thick and thin walled cylindrical pressure vessels, Deflection under flexural loading, statically determinate and indeterminate structure shear flow, strain energy, failure theories, repeated loading and impact loading. Three dimensional stress and strain analysis. Experimental stress analysis.

CCS 311: Biotechnology for Agricultural Engineers (1 Credit)

GNT 311: Business Development and Management (2 Credits)

AEX 311: Introduction to Agricultural Extension & Rural Sociology (2 Credits)

Course Learning Outcome

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

1. Explain the Applications of basic sociological concepts to rural life.
2. Explain Management decision making.
3. Identify the Functions of management,
4. Explain planning, organization, staffing, directing and controlling, financial management,
5. Explain the principles of extension; diffusion, adoption and rejection of innovations. Communication and leadership in agricultural extension.

Course content

Application of basic sociological concepts to rural life. Management decision making. Functions of management, planning, organization, staffing, directing and controlling, financial management, principles of extension; diffusion, adoption and rejection of innovations. Communication and leadership in agricultural extension.

ABE 321: Machine Component Design and Presentation (2 Credits)

Course Learning Outcome

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

1. Explain Part assembly.
2. Present detailed drawing of machine components.
3. Describe Sketching and state the use of standards.
4. Explain Design features, symbols, screws, fastners, couplings, clutches, gears.

5. Explain Machine component design. Presentation of design portfolio.

Course Content

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

ABE 322: Agricultural Land Surveying (3 Credits)

Course Learning Outcome

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

1. Elucidate the Introduction to engineering survey and principles. Chain surveying principles and methods. Field uses and adjustment of Theodolites and levels.
2. Know the Measurement of errors and corrections. Applications, field procedure compass survey, methods, plotting, contours, profiles and cross sections.
3. Explain Traversing: principles, types close and open, bearing and co-ordinates, applications. Methods rise and fall, height of collination: errors and their adjustments.
4. Explain the applications – setting out, contouring , sectoring (longitudinal and cross sections). Tachometry: principles , tachometer, types: stadia tachometry, substance heighting. Electro- magnetic measurement(EDM),
5. Identify the Principles and instrument characteristics, EDM corrections. Applications, introductions to photogrammetry, principles, types: terrestrials and aerial photogrammetry. Land shaping and earthwork.

Definitions, Measurements of distance, use of minor instrument, Random errors Chain surveying. Leveling. Topographic surveys, Transversing, Theodolite traversing, Plane table surveying, Triangulation, Land shaping and earthwork.

Course content

Introduction to engineering survey and principles. Chain surveying principles and methods. Field uses and adjustment of Theodolites and levels. Measurement errors and corrections. Applications, field procedure compass survey, methods, plotting, contours, profiles and cross sections. Traversing: principles, types close and open, bearing and co-ordinates, applications. Methods rise and fall, height of collination: errors and their adjustments. Applications – setting out, contouring , sectoring (longitudinal and cross sections). Tachometry: principles , tachometer, types: stadia

tachometry, substance heighting. Electro- magnetic measurement(EDM), Principles, instrument characteristics, EDM corrections. Applications, introductions to photogrammetry, principles, types: terrestrials and aerial photogrammetry. Land shaping and earthwork.

Definitions, Measurements of distance, use of minor instrument, Random errors Chain surveying. Leveling. Topographic surveys, Transversing, Theodolite traversing, Plane table surveying, Triangulation, Land shaping and earthwork.

ABE 323: Engineering Hydrology (3 Credits)

Course Learning Outcome

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

1. Explain the hydrologic cycle.
2. Explain Solar radiation and weather.
3. Explain Precipitation, Evaporation, Evapotranspiration, infiltration and subsurface flow.
4. Determine Rainfall excess and overland flow. Run-off relations for agricultural watersheds. Streamflow routing.
5. Explain Groundwater flow (hydraulics). Watershed management. Stream gauging, Hydrographs

Course Content

The hydrologic cycle. Solar radiation and weather. Precipitation, Evaporation, Evapotranspiration, infiltration and subsurface flow. Rainfall excess and overland flow. Run-off relations for agricultural watersheds. Streamflow routing. Groundwater flow (hydraulics). Watershed management. Stream gauging, Hydrographs

ABE 324 : Geology for Agricultural Engineering (3 Credits)

Course Learning Outcome

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

1. Describe the earth.
2. Explain the Geological Processes.
3. Identify the Engineering properties of rocks
4. Explain stratigraph. Geotectonics. Geomorphology, Mineralogy and Petrology.
5. Describe the Geology of Nigeria.

Course Content

The earth. Geological Processes. Engineering properties of rocks stratigraph. Geotectonics. Geomorphology, Mineralogy and Petrology. Geology of Nigeria.

CPP 324: Crop Production for Engineers (3 Credits)

Course Learning Outcome

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

1. Elucidate the Classification and ecology of crops in Nigeria.
2. Identify the Nutrient requirements and mineral nutrition of plants.
3. Explain Manures and fertilizers.
4. Explain Plant growth and development. Growth stages tillage and weed control. Other cultural practices.
5. Explain Cropping sequences and rotation. Farming systems. Production practices for specified crops. Introduction to experimental design,
6. Identify and explain the types of experimental design, e.g Completely Randomnized Design, Randomnized Complete Block Design, Latin Square Design, etc. comparison between Treatment Means e.g. LSD, DMRT, etc.

Course Content

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 practices. Cropping sequences and rotation. Farming systems. Production practices for specified crops. Introduction to experimental design, Types of experimental design, e.g Completely Randomnized Design, Randomnized Complete Block Design, Latin Square Design, etc. comparison between Treatment Means e.g. LSD, DMRT, etc.

CAS 321: Animal Production for Engineers (3 Credits)

Course Learning Outcome

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

1. Identify the types of livestock (for eggs, milk, meat, wool etc) and nutrition.
2. Explain the Forage crops and their preservations.
3. Explain Artificial insemination.

4. Describe Livestock housing. Livestock processing equipment.
5. Explain the distribution of livestock in Nigeria.

Course Content

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

EME 321: Engineering Thermodynamics II (3 Credits)

Course Learning Outcome

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

1. Explain Entropy: Clausius inequality; Definition of Entropy; Tabular and graphic entropy data for water and refrigirants;
2. Explain the Tds relationships,Entropy balance for closed systems and control volumes; Isentropic Processes; Isentropic; efficiencies of turbines, nozzoles and compressor;
3. Carry out Exergy Analysis: Definen exergy; exergy reference environment; dead state; exergy equation; exergy balance for a closed system; flow exergy; exeergy balance for a control volumes.
4. Explain vapour power system: simple vapour power plants; thermal efficiency, work ratio; ideal rankine cycles with superheat and reheat; regenerative vapour power cycles.
5. Explain Gas power: simple gas turbine; air standard Braytion cycle, regenerative gas turbine cycles, reciprocating internal combustion engines;
6. Explain air- standard Otto cycles; Diesel cycles; dual cycles. Mixtures and solution.
7. Explain Thermodynamics of gases, vapours, and reactive and non reactive mixtures, process relationships. Concept of equilibrium reversibility and irreversibility.

Course Content

Entropy: Clausius inequality; Definition of Entropy; Tabular and graphic entropy data for water and refrigirants; Tds relationships,Entropy balance for closed systems and control volumes; Isentropic Processes; Isentropic; efficiencies of turbines, nozzoles and compressor; Exergy Analysis: Definition of exergy; exergy reference environment; dead state; exergy equation;exergy balance for a closed system; flow exergy; exeergy balance for a control volumes. Vapour power system: simple vapour power plants; thermal efficiency, work ratio; ideal rankine cycles with

superheat and reheat; regenerative vapour power cycles. Gas power: simple gas turbine; air standard Braytion cycle, regenerative gas turbine cycles, reciprocating internal combustion engines; air- standard Otto cycles; Diesel cycles; dual cycles. Mixtures and solution. Thermodynamics of gases, vapours, and reactive and non reactive mixtures, process relationships. Concept of equilibrium reversibility and irreversibility.

EME 324: Engineering Metallurgy I (2 Credits)

Course Learning Outcome

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

1. Elucidate the Review of properties and selection of engineering materials, metallurgical chemistry and thermodynamics;
2. Explain the modification of properties of engineering materials through changes in micro structure,
3. Explain ethighams diagram- oxidation and reduction of metals – Refractories, furnace. Extraction of metals, iron and steel making; alloy steels, cast irons, aluminum, copper and their alloys.
4. Explain Equilibrium phase diagrams: iron / carbon equilibrium diagram and other phase diagrams.
5. Identify Metals and alloys, their production and use. Nature, origin and control of structure in metallic systems and their relation to mechanical properties.
6. Explain Diffusion, deformation, hardening, transformation. Heat treatment. Metallographic laboratory practice.

Course Content

Review of properties and selection of engineering materials, metallurgical chemistry and thermodynamics; the modification of properties of engineering materials through changes in micro structure, ethighams diagram- oxidation and reduction of metals – Refractories, furnace. Extraction of metals, iron and steel making; alloy steels, cast irons, aluminum, copper and their alloys. Equilibrium phase diagrams: iron / carbon equilibrium diagram and other phase diagrams. 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. Metallographic laboratory practice.

ENG 326: Technical Report Writing and Presentation (1 Credit)

Course Learning Outcome

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

1. State the Principles of effective communication.
2. Identify the Professional use of the English Language.
3. Explain the Principles of technical writing. Meaning and Types of Research.
4. Identify the types of technical report/ Technical Articles. Component parts of a typical project report. Characteristics of an abstract. Importance of Literature Review in a research.
5. Know how to choose a project topic.
6. Explain Citation and Referencing.
7. Carry out Oral presentation of technical ideas (project defence). Tables and figures in a project report.

Course content

Principles of effective communication. Professional use of the English Language. Principles of technical writing. Meaning and Types of Research. Types of technical report/ Technical Articles. Component parts of a typical project report. Characteristics of an abstract. Importance of Literature Review in a research. How to choose a project topic. Citation and Referencing. Oral presentation of technical ideas (project defence). Tables and figures in a project report.

ENG 418: Computational Methods in Engineering (3 Credits)

Course Learning Outcome

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

1. Explain and solve problems of Polynomials and their zeros: methods of bisection, Bairstow synthetic division and lahmer.
2. Explain the Divert methods for the solution of linear equations.
3. Solve problems involving Convergence: interpolation and differentiation method in numerical integration
4. Explain and solve problems involving Newton coates formulae and finite difference methods.

5. Explain and solve the eigenvalue problem solution of ordinary differential equations. Methods of Taylor, Euler, Predictor – corrector and range-Kutta.

Course Content

Polynomials and their zeros: methods of bisection, Bairstow synthetic division and lahmer. Divert methods for the solution of linear equations. Convergence: interpolation and differentiation method in numerical integration Newton coates formulae and finite difference methods. The eigenvalue problem solution of ordinary differential equations. Methods of Taylor, Euler, Predictor – corrector and range-Kutta.

ABE 412: Agro-Resources Structures and Environmental Control (3 Credits)

Course Learning Outcome

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

1. State the Environmental and structural requirements of crops and livestock.
2. Describe the Planning of farm and livestock houses; storage and stores.
3. Design structural members.
4. Explain the Water supply and sewage disposal methods and give Specifications and selection of farm building materials.
5. Explain the Environmental control for plants and livestock. Use of psychrometric charts. Farmstead planning and layout

Course Content.

Environmental and structural requirements of crops and livestock. Planning of farm 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

ABE 413: Directed Studies and Seminar (1 Credit)

Learning objectives

The objective of this course is to broaden the knowledge base of the student and to train him to undertake independent studies. Every student is expected to select a topic of national and professional relevance and of particular interest to the student. The student should thoroughly

research on this topic and write a technically sound seminar paper on it, under supervision. An oral presentation is also required.

Course Learning Outcome

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

1. Undertake independent studies.
2. Select a topic of national and professional relevance and of particular interest to the student.
3. Carry out research on this topic and write a technically sound seminar paper on it, under supervision.
4. Make an oral Presentation of the research work at completion.

Cou**rse Content**

The objective of this course is to broaden the knowledge base of the student and to train him to undertake independent studies. Every student is expected to select a topic of national and professional relevance and of particular interest to the student. The student should thoroughly research on this topic and write a technically sound seminar paper on it, under supervision. An oral presentation is also required.

ABE 414: Engineering Hydraulics II (3 Credits)

Course Learning Outcome

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

1. Explain Pipe flow: pipes in parallel and in series. Branched pipes. Simple pipe network.
2. Explain Water hammer. Hydraulic pump. Back water curves. Hardly cross-method of water distribution.
3. Describe Open channel flow. Channel transition and control. Dimensional analysis and similitude reservoir hydraulic and planning. High pressure outlet, gates, valves.
4. Explain Fluid properties. Fluid statics. Fluid motion. Continuity, Bernoulli, energy, momentum equations.
5. Explain Reynolds number. Laminar and turbulent flows. Pipe flow open channel, flow weirs flumes, pumps, turbine, High pressure outlets, gates valve.

Course Content

Pipe flow: pipes in parallel and in series. Branched pipes. Simple pipe network. Water hammer. Hydraulic pump. Back water curves. Hardly cross-method of water distribution. Open channel

flow. Channel transition and control. Dimensional analysis and similitude reservoir hydraulic and planning. High pressure outlet, gates, valves. 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, turbine, High pressure outlets, gates valve.

ABE 415: Engineering Properties and Handling of Biomaterials (3 Credits)

Course Learning Outcome

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

1. Mention and explain the Physical, mechanical, rheological and thermal properties of agricultural materials.
2. Explain the Newtonian and non-Newtonian fluids.
3. Describe the Characterization of bio-fluids and fluid food viscometer.
4. Explain the Texture and quality of food materials. Mechanical damage. Handling methods.
5. Design and construct appropriate material handling equipment for tropical products.
6. Explain the Economics of material handling.

Course Content

Physical, mechanical, rheological and thermal properties of agricultural materials. Newtonian and non-Newtonian fluids. Characterization of bio-fluids and fluid food viscometer. Texture and quality of food materials. Mechanical damage. Handling methods. Design and construction of appropriate material handling equipment for tropical products. Economics of material handling.

ABE 416: Irrigation and Drainage Principles (3 Credits)

Course Learning Outcome

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

1. Highlight the Water requirement in an irrigation system.
2. Explain the Methods of irrigation. Frequency and amount of irrigation, irrigation water scheduling.
3. Evaluate irrigation systems and practices.
4. Design furrow basin and sprinkler irrigation system.
5. Explain the Effects of poor drainage on plants and soils.
6. Outline the Drainage requirements of crops,

7. Explain the surface drainage and Sub-surface drainage.

Course Content

Water requirement 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. Effects of poor drainage on plants and soils. Drainage requirements of crops, surface drainage. Sub-surface drainage.

ABE 417: Field Operations and Management of Farm Power and Machinery (3 Credits)

Course Learning Outcome

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

1. Explain the Farm power sources.
2. Elucidate the Selection and management of farm tractors and equipment.
3. Conduct Force analysis and power measurement on tillage tools.
4. Evaluate Field performance of equipment adjustment,
5. Explain Trouble shooting in field machinery.Maintenance, and report of farm tractor and equipments, routine maintenance schedules,
6. Drive Tractor
7. Explain the Use of tractor for various field operations.

Course Content

Farm power sources. Selection and management of farm tractors and equipment. Force analysis and power measurement on tillage tools. Field performance evaluation of equipment adjustment, Trouble shooting in field machinery. Maintenance, and report of farm tractor and equipments, routine maintenance schedules, Tractor driving and test. Use of tractor for various field operations. The tractor logbook

ABE 418: Soil and Water Conservation Engineering (3 Credits).

Course Learning Outcome

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

1. Identify and explain the Types of erosion, soil erosion by water,
2. State the Universal soil loss equation

3. Explain the Control of soil erosion by water. Wind erosion and its control, Desertification and control measures.
4. Explain Earth dams and farm ponds.

Course Content

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.

GNT 411: Practicum (2 Credits)

ENG 400: Students Industrial Work Experience Scheme (15 Credits)

ABE 500: Final Year Project (6 Credits)

Individual student undertake a project to deepen knowledge, strengthen practical experience and encourage creativity and independent work. The project will have comprehensive written report to be defended before the academic staff of the Department and an External Examiner.

ABE 511: Bush Clearing and Land Development (2 Credits)

Course Learning Outcome

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

1. Explain Land resources and Land Use Act in relation to Nigerian agriculture
2. Explain the Concept of bush clearing and land development.
3. State the Objectives and methods for bush clearing and land development.
4. Explain the Mechanics of bush clearing and land development.
5. Outline factors in Machinery selection and conduct cost analysis of land development operations.
6. Mention and explain Earth moving machinery and mechanics.
7. Explain the Vegetation types in Nigeria. Land reclamation.

Course Content

Land resources and Land Use Act in relation to Nigerian agriculture Concept of bush clearing and land development. Objectives and methods for bush clearing and land development. Mechanics

of bush clearing and land development. Machinery selection and cost analysis of land development operations. Earth moving machinery and mechanics. Vegetation types in Nigeria. Land reclamation.

ABE 512: Agro-Resources Power and Machinery Systems Management (2 Credits)

Course Learning Outcome

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

1. Explain integrated approach to machinery usage and agricultural production sequence.
2. Explain Equipment selection, scheduling of operation, seasonal factor.
3. Explain Machinery management. Machinery ownership and financing.
4. Carry out Gross margin analysis. Optimization – input combination management of farm enterprise.

Course Content

Integrated approach to machinery usage and agricultural production sequence. Equipment selection, scheduling of operation, seasonal factor. Machinery management. Machinery ownership and financing. Gross margin analysis. Optimization – input combination management of farm enterprise.

ABE 513: Principle of Agro-Industrial Management and Business Law (2 Credits)

Course Learning Outcome

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

1. Explain the Fundamental concepts and Development of management. Functions and process of management.
2. Explain Management decision making. Functions of management, Planning, Entrepreneurship. Feasibility studies. Break even analysis.
3. Explain Trade unions and employers association motivation, manufacturing organization. Project and contract documents/Business and industrial law, principles and basic elements of contract law,
4. Explain declaration of intention, termination of offer, acceptance, terms of a contract, factors that may affect a contract and remedies.

5. Explain Choosing between two competing engineering projects. Liability for injuries. Industrial relations. Employer employee relationship. Wage bargaining and role of state. Track various employer associations. Organizational structure of manufacturing organization.
6. Conduct Market survey feasibility studies. Project and contract documents.
7. Explain Specifications. Planning schedule. Quality control. Survey and safety procedures. Organization. Adoption and rejection of innovations.

Course Content

Fundamental concepts and Development of management. Functions and process of management. Management decision making. Functions of management, Planning, Entrepreneurship. Feasibility studies. Break even analysis. Trade unions and employers association motivation, manufacturing organization. Project and contract documents/Business and industrial law, principles and basic elements of contract law, declaration of intention, termination of offer, acceptance, terms of a contract, factors that may affect a contract and remedies. Choosing between two competing engineering projects. Liability for injuries. Industrial relations. Employer employee relationship. Wage bargaining and role of state. Track various employer associations. Organizational structure of manufacturing organization. Market survey feasibility studies. Project and contract documents. Specifications. Planning schedule. Quality control. Survey and safety procedures. Organization. Adoption and rejection of innovations.

BFE 511: Food Engineering (3 Credits)

Course Learning Outcome

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

1. Explain Heat and mass transfer.
2. Explain Insulation. Heat exchange-design and application.
3. Explain Heat and cold preservation of foods.
4. Explain Blanching, Food quality control.
5. Design food equipment and Food packaging systems.

Course Content

Definition; Heat and mass transfer. Insulation. Heat exchange-design and application. Heat and cold preservation of foods. Blanching, Food quality control. Design of food equipment. Food packaging.

BFE 512: Biomass Engineering (2 Credits)

Course Learning Outcome

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

1. Explain Biomass resources and principles of utilization. Biomass liquid fuels:
2. Identify and explain types, production principles and proesses. Fermentation and distillation technologies.
3. Explain the Biomass gas fuels: types, production, principles and processes.
4. Explain Gasification technology. Gasification reactors. Biomass solid fuels: types, physical and chemical characteristics.
5. Describe Energy crops and their production. Biomass feed stocks. Environmental considerations.

Course Content

Biomass resources and principles of utilization. Biomass liquid fuels: types, production principles and proesses. Fermentation and distillation technologies. Biomass gas fuels: types, production, principles and processes. Gasification technology. Gasification reactors. Biomass solid fuels: types, physical and chemical characteristics. Energy crops and their production. Biomass feed stocks. Environmental considerations.

BFE 513: Solar Energy Applications in Bio-Process Engineering (2 Credits)

Course Learning Outcome

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

1. Explain the Fundamentals of solar radiation. Solar heating and cooling.
2. Explain Heat transfer.
3. Explain Solar energy conversion efficiency.
4. State the Principles of solar collectors.
5. Explain Solar heat storage and storage systems for tropical crops.
6. Describe the Solar pumps. Solar cookers. Solar oven.

Course Content

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. Solar pumps. Solar cookers. Solar oven.

BFE 514: Processing and Storage of Agro Resources Products (3 Credits)

Course Learning Outcome

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

1. Appreciate the Cleaning, sorting, grading and separation Agro Resources Products.
2. Explain the Principles, Techniques and machines communition.
3. Explain Particle size analysis. Heat treatment, dehydration and drying.
4. Explain the Psychometry, storage types and environment.
5. Explain the Deterioration of produce in storage structures. Environmental control in storage.

Course Content

Cleaning, sorting, grading and separation. Principles, Techniques and machines communition. Particle size analysis. Heat treatment, dehydration and drying. Psychometry, storage types and environment. Deterioration of produce in storage structures. Environmental control in storage.

SAE 511: Design of Irrigation Systems (3 Credits)

Course Learning Outcome

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

1. Design an open channels and conduct Water flow measurement.
2. Explain Pumping power requirements.
3. Design an Irrigation systems: border, sprinkler, drip etc.
4. Explain salinity and quality of Irrigation water. Reclamation of saline and alkaline soil. Seepage from canals and canal lining.
5. Design an Irrigation project. Evaluating irrigation system and practice.
6. Explain Irrigation water management.

Course Content

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 alkaline soil. Seepage from canals and canal lining. Design of an Irrigation project. Evaluating irrigation system and practice. Irrigation water management.

SAE 512: Rural Water Supply and Sanitation (3 Credits)

Course Learning Outcome

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

1. Explain Water requirements. Water quality standards.
2. Identify and explain Water borne disease.
3. Explain Biochemical oxygen demand. Potable water impurities. Sources and treatment methods of water for rural homes. Water lifting devices.
4. Explain Transportation and distribution systems. Pipes sizes.
5. Explain Waste disposal in rural areas. Septic tanks, digestion ponds and family privies.

Course Content

Water requirements. Water quality standards. Water borne disease. Biochemical oxygen demand. Potable water impurities. Sources and treatment methods of water for rural homes. Water lifting devices. Transportation and distribution systems. Pipes sizes. Waste disposal in rural areas. Septic tanks, digestion ponds and family privies.

SAE 513: Design of Irrigation and Soil Conservation Structures (2 Credits)

Course Learning Outcome

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

1. Explain Vegetative water ways and its uses.
2. Explain the Design, construction and maintenance of water ways.
3. Describe Terracing and construction.
4. Elucidate the Review of relevant hydraulic theories.
5. Explain the Critical depth and hydraulic pump. Design of Irrigation structures. Design of soil conservation structures.
6. Explain the Design of drop spillways, chutes and culverts.

Course Content

Vegetative water ways and its uses. Design, construction and maintenance of water ways. Terracing and construction. Review of relevant hydraulic theories. Critical depth and hydraulic pump. Design of Irrigation structures. Design of soil conservation structures. Design of drop spillways, chutes and culverts.

SAE 514: Aquacultural Engineering (2 Credits)

Course Learning Outcome

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

1. Explain Aquacultural systems and their environmental requirements.

2. Highlight the Primary constraints in aquacultural systems.
3. Identify the Materials for aquacultural facilities.
4. Design an aquacultural facilities.
5. Highlight the Designs principles and considerations for raceways. Site selection for net pens.
6. Know the Net pen design and construction.
7. Explain the Biomass loading of tanks. Labour requirements. Equipment and controls aquacultural systems.
8. Explain Aquacultural wastes handling.

Course Content

Aquacultural systems and their environmental requirements. Primary constraints in aquacultural systems. Materials for aquacultural facilities. Designs of aquacultural facilities. Designs principles and considerations for raceways. Site selection for net pens. Net pen design and construction. Biomass loading of tanks. Labour requirements. Equipment and controls aquacultural systems. Aquacultural wastes handling.

APM 511: Agricultural and Bio Resources Power (2 Credits)

Course Learning Outcome

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

1. Identify Farm power sources:
2. Explain Farm tractors' selection, use, and maintenance.
3. Explain other power sources: selection, use and maintenance.
4. Explain the Hitches and hitching system.
5. Highlight the Design consideration of a single cycle two wheel drive, four wheel drive and crawler tractors. Tractor mechanics.
6. Explain Power measurement. Fluid control. Tractor testing and test codes.

Course content

Farm power sources: Farm tractors; selection, use, maintenance. Other power sources: selection, use and maintenance. Hitches and hitching system. Design consideration of a single cycle two

wheel drive, four wheel drive and crawler tractors. Tractor mechanics. Power measurement. Fluid control. Tractor testing and test codes.

APM 512: Agro-Resources Machinery I (1 Credit)

Course Learning Outcome

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

1. Identify the Types of farm machinery.
2. Conduct Force analysis and state the design consideration of various farm machinery.
3. Explain Hitching methods.
4. Highlight the Power requirements for operating farm equipment and machines.
5. Carry out Field evaluation and highlight Criteria for replacement.

Course Content

Types of farm machinery. Force analysis and design consideration of various farm machinery. Hitching methods. Power requirements for operating farm equipment and machines. Field evaluation. Criteria for replacement.

ABE 521: Design of Agro-Resources Machinery (2 Credits)

Course Learning Outcome

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

1. Explain Machine design processes and procedures.
2. Explain Materials of construction, selection, strength properties, stress analysis and costing.
3. Explain Design of machine elements.
4. Carry out Machine fabrication. Typical design of low cost agricultural machinery.
5. Explain the Problems and prospects of agricultural machinery development, and commercial manufacture in Nigeria.

Course Content

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

ABE 522: Electrification and Alternative Energy Sources (3 Credits)

Course Learning Outcome

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

1. Explain Electrical codes, tariffs, and regulation. Generation and transmission of electricity.
2. Explain Farmstead distribution systems. Testing procedure. Power factor correction.
3. Explain Selection and use of electric motors. Transformers.
4. Describe Energy conversion.
5. Explain the Application of electricity to handling, processing and storage of agricultural products.
6. Explain the Basic electronic applications to farm electrical processes.

Course content

Electrical codes, tariffs, and regulation. 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.

ABE 523: Agro-Resources Transportation and Ergonomics (2 Credits)

Course Learning Outcome

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

1. Explain Farm Roads. Farm transportation system. Need for efficient farm transportation system.
2. Describe Development and construction of farm transportation equipment.
3. Explain Farm transport- systems, standards and specification,
4. Explain the Ergonomics; factors that affect the operators, Man machine relationship. Anthropometry,
5. Explain Human energy generation and measurement.

Course Content

Farm Roads. Farm transportation system. Need for efficient farm transportation system. Development and construction of farm transportation equipment .Farm transport- systems,

standards and specification, Ergonomics; factors that affect the operators, Man machine relationship. Anthropometry, Human energy generation and measurement.

ABE 524: Agricultural and Bioresources Mechanization (2 Credits)

Course Learning Outcome

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

1. Identify the objectives of agricultural mechanization.
2. Identify the Factors affecting agricultural mechanization in the tropics.
3. Conduct Analysis of production systems.
4. Explain Agricultural mechanization as a strategy for rural development.
5. Explain Impact on food production and on infrastructure development. Linkages with rural industrialization.
6. Describe the Systems approach to agric mechanization. Levels of agricultural mechanization.

Course Content

Name and objectives of agricultural mechanization. Factors affecting agricultural mechanization in the tropics. Analysis of production systems. Agricultural mechanization as a strategy for rural development. Impact on food production and on infrastructure development.Linkages with rural industrialization. Systems approach to agric mechanization. Levels of agricultural mechanization

ABE 525: Environmental Engineering (3 Credits)

Course Learning Outcome

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

1. Design unit operations and processes in water and waste water treatment.
2. Explain Sedimentation. Conical coagulation. Ion exchange. Filtration. Disinfection.
3. Explain Water supply treatment and distribution. Water quality.
4. Describe Wastewater handling, treatment and disposal.
5. Explain Solid waste disposal. Air pollution and control.

Course content

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

distribution. Water quality. Wastewater handling, treatment and disposal. Solid waste disposal. Air pollution and control.

ABE 526: Foundation Engineering (3 Credits)

Course Learning Outcome

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

1. Explain Stress in soils. Consolidation, compaction.
2. Explain CBR and soil improvement. Stability of slopes.
3. Carry out Earth pressure analysis. Bearing capacity and settlement analysis of shallow and deep foundations.
4. Design footings, foundations, retaining walls.
5. Carry out Analysis and control of groundwater.

Course Content

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.

PPF 521: Mechanics of Deformable Bodies (2 Credits)

Course Learning Outcome

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

1. Explain three dimensional stress and strain.
2. Know the Theories of failure.
3. Explain Stress concentration, moments and products of inertia and area.
4. Explain Mohr's strain and inertia circles.
5. Explain Unsymmetrical bending, shear centre. Curved beams.

Course Content

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 centre. Curved beams.

APM 521: Agro-Resources Machinery II (2 Credits)

Course Learning Outcome

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

1. Explain Operation and maintenance of farm machinery,
2. Conduct Field evaluation and criteria for replacement.
3. Explain Animal traction.
4. Describe Force relations for tillage implements.
5. Describe Fertilizer distribution equipment.

Course content

Operation and maintenance of farm machinery, Field evaluation and criteria for replacement. Animal traction. Force relations for tillage implements. Fertilizer distribution equipment.

SAE 521: Agricultural Land Drainage (2 Credits)

Course Learning Outcome

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

1. Explain Surface drainage. Sub-surface drainage.
2. Design drainage systems.
3. Explain Envelop material and their design.
4. Explain Loads on conduits.
5. Explain Drainage pumping. Construction and installation of drains. Maintenance of drains.

Course content

Surface drainage. Sub-surface drainage. Design of drainage systems. Envelop material and their design. Loads on conduits. Drainage pumping. Construction and installation of drains. Maintenance of drains.

BFE 522: Packaging & Containerization Engineering (2 Credits)

Course Learning Outcome

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

1. Explain the Purpose of packaging food and biomaterials.
2. Identify Packing types.
3. Explain Marketing requirements for packaging. Storage environmental requirements.

4. Identify the types of packing configuration. Palletization. Canning technology.
5. Explain Aseptic processing and packaging. Modified atmosphere packaging and applications.
6. Explain Maximum allowable load concepts and containerization design.

Course Content

Purpose of packaging food and biomaterials. Packing types. Marketing requirements for packaging. Storage environmental requirements. Types of packing configuration. Palletization. Canning technology. Aseptic processing and packaging. Modified atmosphere packaging and applications. Maximum allowable load concepts and containerization design.

4.0 EMPLOYMENT OPPORTUNITIES

"Do not love sleep or you will grow poor; stay awake and you will have food to spare" Proverbs 20:13.

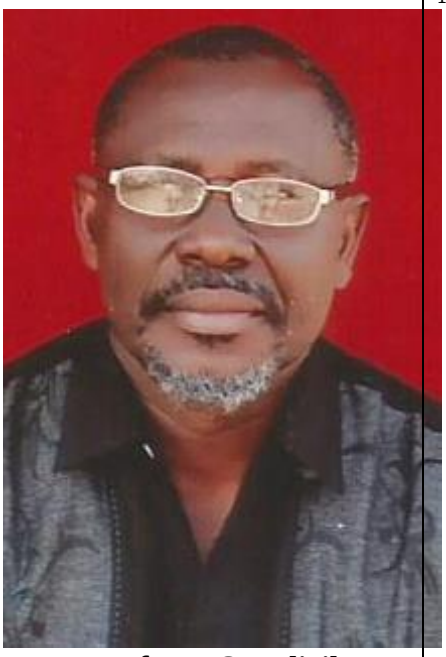
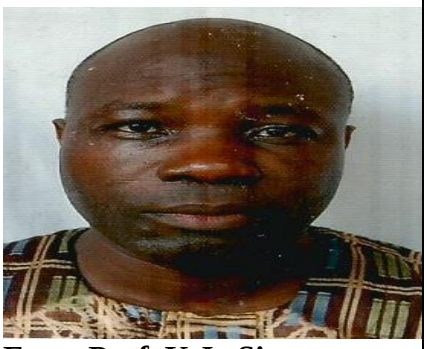
Agricultural & Biorsources Engineering provides a background for careers in design, development, manufacture, testing, research, management and sales. Graduates are employed in agricultural- related industries, consulting firms and service organizations, Federal and State Ministries of Agriculture, fisheries, water resources, rural development, science and technology and their numerous agencies, food processing companies, farm machinery companies, construction companies, irrigation and drainage companies and engineering component sales companies and banks. Graduates can also find employment in educational and business areas, environmental protection and soil conservation agencies, Rival Basin Development Authorities, among others in public and private sectors of the economy.

In addition, Agricultural & Bioresources Engineering Department is for those who:

- Are challenged to find practical solutions to critical problems
- Have a strong engineering aptitude and like to experiment with machinery, structures, soil, water, power or electronics systems.
- Have interest in agriculture, biology or any of the sciences.
- Like food production, animal care, nature or environmental conservation, or outdoor activities
- Like diversity and a profession which a wide selection of career opportunities.

5.0. LISTOF ACADEMIC STAFF BY QUALIFICATION, AREA OF SPECIALIZATION AND RANK

"Fruits are conspicuous while roots are obscure, yet the roots determine the fruits. How deep you are will determine how high you will grow".

Names	Sex	Qualifications (with dates obtained), Awarding Institution, Area of specialization and Affiliation	Rank
 **Engr. Prof. V.I.O. Ndirika**	Male	**Qualifications:** PhD (Farm Power and Machinery,1997) Post Harvest Technology Option, ABU, Zaria; M.Sc. (Farm Power and Machinery, 1993), Post Harvest Technology, ABU, Zaria; B. Tech. (Agric. Engineering and Mechanization, 1988), FUT Akure; WASC (1979/80); First School Leaving Certificate (1973). **Specialization:** Post Harvest Processing Engineering **Professional Affiliation:** Fellow, Nigerian Institution of Agricultural Engineers ***(FNIAE);*** Member, Nigerian Society of Engineers ***(MNSE);*** Registered Engineer, Council for the Regulation of Engineering in Nigeria***(COREN);***Member, American Society of Agricultural and Biological Engineers ***(MASABE).***	Professor
 **Engr. Prof. K.J. Simonyan**	Male	**Qualifications:** PhD (Agric. Engineering, 2006), ABU, Zaria; M.Sc (Agric. Engineering, 1997), ABU, Zaria; B. Eng. (Agric. Engineering, 1988), UNILORIN, Ilorin; WASC/GCE O'' Level (1983, Titcombe College, Egbe). **Specialization:** Post Harvest Processing Engineering	Professor

		Professional Affiliation: Fellow, Nigerian Institution of Agricultural Engineers (FNIAE); Member, Nigerian Society of Engineers (NSE); Member, Farm Management Association of Nigeria (FAMAN); Registered Engineer, Council for the Regulation of Engineering in Nigeria (COREN); Member, American Society of Agricultural and Biological Engineers (MASABE).	
 **Engr. Prof. I. E. Ahaneku**	Male	**Qualifications:** PhD (Agricultural Engineering, 1997), UI, Ibadan; MSc (Agricultural Engineering, 1985), UI, Ibadan; B.Sc (Agricultural Engineering, 1981), UI, Ibadan; WAEC (1974, Awommama Comp. Secondary School, Awommama, Imo State). **Specialization:** Soil and Water Conservation, Soil Tillage, Irrigation and Drainage, Environmental Mangement, Agro-Meteorology, Agricultural Machinery and Equipment Testing. **Professional Affiliation:** Fellow, Nigerian Institution of Agricultural Engineers ***(FNIAE);*** Member, Nigerian Society of Engineers ***(MNSE);*** Registered Engineer, Council for the Regulation of Engineering in Nigeria ***(COREN);*** Member, American Society of Agricultural and Biological Engineers ***(MASABE).***	Professor

 **Engr. Prof. A.B. Eke**	Male	**Qualifications:** PhD (Agric. Power and Machinery Engineering, 2003), Processing/Storage, ABU, Zaria; M.Sc. (Agric. Engineering, 1992), ABU, Zaria; B.Eng. (Agric.Engrg,1986), UN, Nsukka; WASC (1979), Item High School, Item; First School Leaving Certificate (1973), Umunnato Central Schl, Apuana Item, Abia State. **Specialization:** Post harvest and Renewable Energy Application engineering **Professional Affiliation:** Fellow, Nigerian Institution of Agricultural Engineers ***(FNIAE);*** Member, Nigerian Society of Engineers ***(MNSE)***. Registered Engineer, Council for the Regulation of Engineering in Nigeria ***COREN);*** Member, American Society of Agricultural and Biological Engineers ***(MASABE).***	Professor
 **Engr. Prof. U. N Onwuka**	Male	**Qualifications:** PhD (2006), Food Engineering, MOUAU; MSc. (1994), Food Process Engineering, Kuban State University of Tech., Russia; WAEC (1986), Wilcox Mem. Comp. Sec. School, Aba. **Specialization:** Food Engineering **Professional Affiliation:** Corporate Member, Nigerian Institution of Agricultural Engineers (NIAE); Corporate Member, Nigerian Society of Engineers (MNSE); Registered Engineer, Council for the Regulation of Engineering in Nigeria(COREN); Member, Nigerian Institute of Food Science and Technology.	Professor

Engr. Prof. Aviara N. Aviara	Male	**Qualifications: Ph.D (Processing and Storage)** University of Ibadan, Ibadan 2010; M.Sc. University of Ibadan, 1994; and B.Eng (Hons) of Federal University of Technology, Owerri, 1988. **Specialization:** **Agricultural Product Processing and Food Engineering**	Professor
 **Engr. Prof. J.U. Etoamaihe**	Male	**Qualifications:** Ph.D (2011), Food Engineering (MOUAU); M. Eng. (1992) Agricultural Engineering, UNN; B. Eng. (1983), Agricultural Engineering, UNN. **Specialization:** Farm Power & Machinery, Food Engineering **Professional Affiliation:** Member, Nigerian Institution of Agricultural Engineers *(NIAE);* Member, Nigerian Society of Engineers *(MNSE);* Registered Engineer, Council for the Regulation of Engineering in Nigeria *(COREN);* Member, American Society of Agricultural and Biological Engineers *(ASABE).*	Professor
 **Engr. Prof. J.C. Adama**	Male	**Qualifications:** PhD (Farm Power and Machinery, 2013); M.Eng.(Farm Power and Machinery Engineering, 1997), University of Nigeria, Nsuka; B.Eng. (Agric Engineering, 1990);General Certificate of Education A - Level, (1984, Suleja, Academy); General Certificate of Education O Level,(1981, Bubendorff Mem. Gram. Schl, Adazi, Anambra State); FSLC (1976), Community Primary Schl, Okutu, Nsukka LGA. **Specialization:**	Professor

		Farm Power and Machinery Engineering **Professional Affiliation:** Nigerian Institution of Agricultural Engineers (FNIAE); Member, Nigerian Society of Engineers (MNSE); Registered Engineer, Council for the Regulation of Engineering in Nigeria (COREN);Member, American Society of Agricultural and Biological Engineers (ASABE).	
 **Engr. Prof. M.C. Ndukwu**	Male	**Qualifications:** PhD (2014), FUT. Akure; M.Eng. (2005), FUT. Akure; B.Eng. (1998), (Farm Power & Machinery), FUT. Owerri; SSCE (1991), Sec.Tech.Schl. Umuowa, Orlu; FSLC (1985), Community Primary School, Umuowa. **Specialization:** Processing Engineering **Professional Affiliation:** Member, Nigerian Institution of Agricultural Engineers *(NIAE);* Registered Engineer, Council for the Regulation of Engineering in Nigeria *(COREN);* Member, American Society of Agricultural and Biological Engineers *(ASABE).*	Professor

 **Engr. Dr. Okechukwu Oduma**	Male	**Qualifications:** Ph.D (In View), ESUT; M.Eng (2008), ESUT, Enugu; B. ENG (2001), ESUT, Enugu; SSCE (1996), Boy's Sec Schl, Ezzangbo, Ebonyi; Comm. Sec. Schl. Obollo Afor, Enugu; FSLC (1988), Central Schl, Ezzangbo, Ebonyi State. **Specialization:** Soil and water Engineering **Professional Affiliation:** Nigerian Institution of Agricultural Engineers ***(NIAE);*** Member, Nigerian Society of Engineers ***(MNSE)***	Associate professor
 **Engr. C.U. Orji**	Male	**Qualifications:** M.Eng (1994), Agric. Engrg, U.N. Nsukka, Anambra State; B.ENG (1989), Agric. Engrg, FUTO; WAEC(1984), Umuagbaghi Sec Schl, Aba, Abia State. **Specialization:** Processing Engineering **Professional Affiliation**: Corporate member, Nigerian Institution of Agricultural Engineers (NIAE); Corporate member, Nigerian Society of Engineers (MNSE); Registered Engineer, Council for the Regulation of Engineering in Nigeria (COREN); Member, American Society of Agricultural and Biological Engineers (ASABE).	Lecturer I

 **Engr. Dr. C.C. Emeka-Chris**	Female	**Qualifications:** Ph.D (Soil & Water Engineering) In View; M. Eng. (2005), Soil & Water Engineering, FUTO; B. Eng (1989), Agric. Engineering, FUTO; WAEC (1982), F.G.G.C. Bakori, Katsina State. **Specialization:** Soil and water Engineering **Professional Affiliation:** Member, Nigerian Institution of Agricultural Engineers *(NIAE);* Member, Nigerian Society of Engineers *(MNSE);* Registered Engineer, Council for the Regulation of Engineering in Nigeria*(COREN);* Member, American Society of Agricultural and Biological Engineers *(ASABE).*	Lecturer I
 **Engr. Pearse Olawale**	Male	**Qualifications:** M. Eng. (2003), ABU; B. ENG. (2007), FUT. Akure; SSCE (1995), Oduduwa Sec. School, Mushin, Lagos; PSLC (1989), St. Michael Pry Schl, Mushin, Lagos. **Specialization:** Soil and Water Engineering **Professional Affiliation:** Nigerian Institution of Agricultural Engineers ***(NIAE)***	Lecturer I

 **Engr. Dr. A. O. Igbozulike**	Male	**Qualifications:** PhD (In View), MOUAU; MSc (2008), University of Ibadan; B. Eng. (2002), FUTO, Owerri; SSCE (1995), Bishop Shanahan College, Orlu, Imo State; FSLC, Practising School 1, Orlu, Imo State. **Specialization:** Agro-products postharvest processing **Professional Affiliation:** Member, Nigerian Institution of Agricultural Engineers ***(MNIAE);*** Member, Nigerian Society of Engineers ***(MNSE);*** Member, American Society of Agricultural & Biological Engineers **(MASABE)**	Senior Lecturer
 **Engr. Dr. Ugwu Elijah**	Male	**Qualifications:** PhD (In View); M. Sc (2014) Queen's University, Belfast, UK; B. Eng(2007), MOUAU; SSCE (2001), St. Patrick Sec. Schl. Emene, Enugu State. **Specialization:** Soil and Water Engineering	Senior Lecturer

 **Engr. Onu Olughu Onu**	Male	**Qualifications:** M. Eng (2015), MOUAU; B. Eng (2011), FUTO; SSCE (2002), Urban Model Sec. Schl. Abakaliki, Ebonyi State; FSLC (1996), Ugba Comm. Pry, Umuahia. **Specialization:** Farm Power and Machinery Engineering **Professional Affiliation:** Corporate member, Nigerian Institution of Agricultural Engineers (NIAE); Corporate Member, American Society of Agricultural & Biological Engineers (ASABE); Graduate Member, Nigerian institute of Management (Chartered).	Lecturer I
 **Engr. Chukwuka Austine Onyenwoke**	Male	**Qualifications:** M.Eng (2015), MOUAU; B. ENG (2010), MOUAU; HND (2006), ABU, Zaria; WASSCE, Comprehensive College, Zaria; PSLC (1997), Judy Children Pry Schl, Zaria, Kaduna State. **Specialization:** Post Harvest Processing Engineering **Professional Affiliation:** Nigerian Institution of Agricultural Engineers (NIAE).	Lecturer I

 **Engr. James C. Ehiem**	Male	**Qualification:** PhD (In View), MOUAU; M. Eng (2008), Uni Agric., Makurdi; P.GD (2003); HND (2002), Div of Agric. Coll, ABU, Zaria; SSCE (1991), Sec Comm Schl, Ehime LGA; FSLC (1985), Comm. Pry Schl, Ehime. **Specialization:** Post harvest Processing **Professional Affiliation:** Nigerian Institution of Agricultural Engineers (NIAE); Member, American Society of Agricultural and Bio-Resources Engineering (ASABE); National Association of Technologists in Engineering (NATE); COREN Registration in progress.	Senior Lecturer
 **Engr. Oluwaseun Stephen Ojedele**	Male	**Qualifications:** M.Sc (2015); University of Ibadan, Ibadan; B.Tech (2009) LAUTECH, Ogbomoso, WAEC & NECO (2002), FGC Ilorin; PSLC (1996), St. Francis Nur/Pry Schl, Oyo. **Specialization:** Farm Structure and Environmental Engineering **Professional Affiliation:** Member, Nigerian Institution of Agricultural Engineers (NIAE)	Lecturer I

 **Engr. Francis N. Orji**		**Qualifications:** M.Sc (In View), FUTO; B. Eng (2010), FUTO; G.C.E O' level (2001). **Specialization:** Soil and Water Engineering **Professional Affiliation:** Nigerian Institution of Agricultural Engineers (NIAE); Member, American Society of Agricultural and Biological Engineers (ASABE).	Lecturer I
 **Engr. Dr. Precious Ehiomogue**	Male	**Qualifications:** M.Sc (In View), Cranfield University, UK; B. ENG (2011), FUT MINNA; OND (2003), Auchi Polytechnic, Auchi; WAEC (2000), Auchi, Edo State. **Specialization:** Soil and Water Engineering	Lecturer I

 **Engr. Goziechukwu Inekwe**	Male	**Qualifications:** M.Sc. University of Ibadan, Ibadan; B. Eng (2011); ABU, Zaria; WASC (2006), Demonstration Sec.Schl, ABU Zaria; PSLC (2000), Buks Int'l Schl, Zaria, Kaduna State. **Specialization:** Power and Machinery Engineering	Lecturer II
 **Engr. Chidinma Nebonta**	Female	**Qualifications:** M.Eng (In View), Michael Okpara Univ. of Agric., Umudike; B.ENG (2007), UN Nsukka; SSCE (2000), St. Cyprians Special Science Schl, Nsukka. **Specialization:** Post Harvest Processing Engineering	Lecturer I
 **Engr. Ikechukwu Okosa**	Male	**Qualifications:** B.Eng, (2011) Michael Okpara Univ. of Agric., Umudike; M.Sc (In View); Michael Okpara Univ. of Agric., Umudike; S.S.C.E.(2006), Community Secondary School, Umuohu, Bende. **Specialization:** Post-Harvest Processing Engineering	Lecturer I

6.0. LISTOF NON-ACADEMIC STAFF BY QUALIFICATION, AREA OF SPECIALIZATION AND RANK

Speak softly and carry a big stick; you will go far. -Theodore Roosevelt

Names	Sex	Qualifications (with dates obtained), Awarding Institution, Area of specialization and Affiliation	Rank
 **F.O. Nkwazema**	Male	**Qualifications:** M. Eng (2017) MOUAU, HND (2000), Federal Polytechnic, Nekede, Owerri; OND (1997), Federal Polytechnic, Nekede, Owerri; SSCE (1993), Colliery Comp. Sec. Schl, Ngwo, Enugu; FSLC (1987), Market Road Pry Schl, Ogui, Enugu **Specialization:** Soil and Water **Professional Affiliation:** Registered Engineers, COREN; Member, National Association of Technologists in Engineering.	Chief Technologist
 **Amanze Nancy (Mrs)**	Female	**Qualification:** HND (2006), Federal Polytechnic, Nekede, Owerri; OND (2001), Samaru Coll. of Agric. ABU, Zaria; WAEC (1999); FSLC (1989), New Haven Pry Schl II, Enugu. **Specialization:** Soil and Water **Professional Affiliation:** Registered Engineers, COREN; Member, National Association of Technologists in Engineering (NATE).	Chief Technologist

 **Okafor-Yadi Osemedua**	Male	**Qualification:** PGD (2010); HND (2004), SCA. ABU, Zaria; OND (2004), SCA. ABU, Zaria. **Specialization:** Farm Power and Machinery **Professional Affiliation:** Member, Nigerian Institution of Agricultural Engineers (NIAE); Registered Engineers, COREN; Member, National Association of Technologists in Engineering (NATE); Chartered Member, Nigerian Institute of Management; Member, Association of Maintenance and Design Engineers.	Principal Technologist
 **Cyprian Dirioha**	Male	**Qualifications:** B. Eng (2007, Agric. Engrg), ESUT, Enugu; SSCE (2002), C.S.S. Aguobu, Umumba; FSLC (1996), G.S. Bai Panya, Cameroun. **Specialization:** Bio-processing **Professional Affiliation:** Member, NATE	Engineer II
 **Joseph O. Unachukwu**	Male	**Qualifications:** B. Eng (2007, Agric. Engrg), ESUT, Enugu; SSCE (2002), St. Peters Special Science Sec.Schl, Achina; FSLC (1996), Pry Schl, Eke, Achina. **Specialization:** Bio-processing	Engineer II

Ikechukwu Isaac Okwor 	Male	**Qualifications:** Diploma (Motor Vehicle Engrg), City and Guild, London; Diploma Gen. Agric (1992), Coll. of Agric, Igbariam; WASC (1985), Ngbo Boys, Ishielu; Fed. Trade Test (1998), Fed Min of Labour; FSLC (1978), Central Schl, Oji River. **Specialization:**Tractor Operation	Principal Technical Officer II

7.0 LIST OFADMINISTRATIVE STAFF

Table 7.1 List of Administrative Staff

S/N	Name	Rank
1	Duru Nkemjika Michael	Administrative Assistant
2	Onyechere Ugochi Merit	Senior Confidential secretary
3	Hezekiah Ihunanyachi	Executive Officer
4	Luke chimechefulam	Senior clerical officer
5	Kingsley Juan Jerry	Assistant Registrar
6	Obini-Ekpe Fatima Uchenna	Administrative Officer

7.0. LABORATORIES/WORKSHOPS IN AGRICULTURAL AND BIORESOURCES ENGINEERING

Laboratory/Workshop

1. Farm Power and Machinery Laboratory
2. Soil and Water Laboratory
3. Processing Laboratory