MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE

AGRICULTURAL AND BIOSYSTEM ENGINEERING DEPARTMENT HANDBOOK

REVISED 2025

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.

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Head of Department
2025.

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SECTION 1

INTRODUCTION

1.1 Overview of Agricultural and Biosystems Engineering Program

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, Biosystems, 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.

1.2 Scope

The study of Agricultural & Biosystem 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 & Biosystem 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 & Biosystem 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 & Biosystem 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 & Biosystem Engineering.

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

1.3 History of Agricultural & Biosystem Engineering Department

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 catalysing, 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 kilometres 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 Biosystem Engineering as fallout from COREN accreditation and new CCMAS curriculum.
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. However, with the recent adjustment in the curriculum of Nigerian universities by NUC which introduced the current CCMAS curriculum, the name of the department was changed to Agricultural and Biosystem Engineering. The addition of Biosystem 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 Engr. (Prof.) M.C. Ndukwu heads the Department. The Department has graduated 14 sets of students. The core 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).

SECTION 2

PHILOSOPHY AND PROGRAMME OBJECTIVES

2.1 Philosophy of the Programme

The primary philosophy guiding the training of Agricultural & Biosystem 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 & Biosystem 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 of 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.

2.2 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.

2.3 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 person sensitive technologies, and to enhance the well-being of the people through extension services and other interventions.

2.4 Core Values
Excellence, Integrity, Commitment, Diligence, Truth, Respect, Fairness and Justice.

2.5 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 Biosystem Engineering, Michael Okpara University of Agriculture Umudike.
The minimum expectations on the graduates of the Agricultural and Biosystem Engineering Department embodies the PEOs, which are presented in Table 2.1.

Table 2.1: 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 Niger ia.
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.

2.6 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 Biosystem Engineering of Michael Okpara University of Agriculture Umudike are presented in table 1.1, showing also the relevant graduate characteristics.

Table 2.2: 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 engineer ing 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 recogniz e 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 understa nding 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.

2.7 Knowledge Attribute Profile

The curriculum shall encompass the knowledge profile as summarised in the Table 2.3:

Table 2.3: 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 Biosystem Engineering.
K3	A systematic, theory-based formulation of engineering fundamentals required in Agricultural and Biosystem Engineering.
K4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in Agricultural and Biosystem Engineering.
K5	Design creative solutions for complex engineering problems and design systems, components or processes to meet iden tified 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 Biosystem Engineering..
K7	Knowledge of the role of engineering in society and identified issues in engineering practice in Agricultural and Biosystem Engineering, such as the professional responsibility of an engineer to pu blic safety and sustainable development.
K8	Engagement with selected knowledge in the current research literature of Agricultural and Biosystem 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.

2.8 Definition of Complex Problem Solving

The range of complex problem solving which the graduate of Agricultural and Biosystem Engineering must be capable of is defined in Table 2.4. In Table 2.4, complex engineering problems have characteristics P1 and some or all of P2 – P7.

Table 2.4: 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 so lution 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

2.9 Definition of Complex Engineering Activities

The range of complex engineering activities is defined in Table 2.5. Complex engineering activities refer to activities or projects that have some or all the characteristics of Table 2.5.

Table 2.5: 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.

SECTION 3

REQUIREMENTS FOR ADMISSION AND GRADUATION

3.1. Entry Requirements

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

(i) Universities Matriculation Examination (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.

3.2. Duration of Study

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.

3.3. 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.

3.4. 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: Grading System of Obtainable Scores

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

3.5. 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 based 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: Final Assessment and Class of Degree

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	2.50-3.49
3rd Class Degree	45 – 49	1.50-2.49

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.

3.6 Probation

A student whose Cumulative Grade Point Average is below 1.00 at the end of a particular year of study, earns a period of probation for one academic session. A student on probation is allowed to register for courses at the next higher level in addition to his/her probation level courses provided that: the maximum of 18 credit units per semester is not exceeded.

(a) The regulation in respect of student work-load is complied with; and

(b) The pre-requisite courses for the higher level courses have been passed.

3.7 Withdrawal and Transfer of Students to other Programmes in the University

A candidate whose Cumulative Grade Point Average is below 1.00 at end of a particular year of probation should be required to withdraw from the University. However, in order to minimise waste of human resources, consideration is

usually given to withdrawal from programme of study and possible transfer to other programmes within the University.

3.8 Transfer of Credits

Universities are enjoined to run comparable syllabi to enable students who transfer from one university to another transfer their credits wholly. Students who transfer from one programme to another within the University are also allowed to transfer all their credits relevant to the required courses in the new programme. The student should meet his course adviser to facilitate such transfer of credits.

3.9 Temporary Withdrawal

A student may apply to the Senate for a temporary withdrawal for a whole academic session if for any reason the student is not able to participate in academic activities for that particular session. Such reasons could be financial constraint, poor health, etc. For the reason of poor health, a medical report from a good hospital must be presented and certified by the University Medical Centre.

3.10 Waiver of Semester

A Student will be required to apply to the Chairman of Senate Business Committee for a waiver of any Semester in which he/she has no course to do. This will be subject to recommendations by the College Board.

3.11 Missed Exams

Where a student has a cogent reason to miss an exam, the student will be required to apply to the Chairman of Senate Business Committee for permission to retake the missed exam at the next available opportunity. Where the reasons are not cogent, the student would be required to retake the course as a failed course.

SECTION 4

MISCONDUCTS, SANCTIONS, AND CONFLICT RESOLUTION

The various sanctions for Examination Misconduct and Other Related Offences as Approved by Senate of Michael Okpara University of Agriculture, Umudike at its 134th Regular Meeting Held on May 11, 2011. Are as follows:

Table 4.1 Misconducts and Sanctions

S/N	Offence/Misconduct	Sanction
1.	Communication with any Student in any manner, receiving assistance or giving assistance to another student(s) during examination.	Rustication for two (2) semesters; expulsion at repeat of same offence/misconduct.
2.	Impersonation in an examination	Expulsion for the impersonator and the impersonated
3.	Copying or reading from another student's answer script during an examination or opening one's script or material for another student to read or copy.	Rustication for two (2) semesters; expulsion at repeat of same offence/misconduct
4.	Bringing into the examination hall/room any unauthorized materials such as books, notes, papers, devices, phones, manuscripts.	Expulsion from the University
5.	Involvement in leaking examination question papers or any form of unauthorized handling of examination questions.	Expulsion
6.	Forging, altering or presenting medical report in order to obtain deferment of an examination or any other benefit	The culprit will face the Student Disciplinary Committee.
7.	Lobbying for examination grades by whatever means	The culprit will face the Student Disciplinary Committee.
8.	Involvement in any other form of cheating or other acts intended to confer undue advantage on the student.	Rustication for two (2) semesters; expulsion at repeat of same offence/misconduct.
9.	Aiding, abetting or covering examination misconduct by any student.	Rustication for two (2) semesters; expulsion at repeat of same offence/misconduct.

10.	Refusal to make a written statement or sign any of the materials to be used as exhibits in support of an examination misconduct.	Expulsion
11.	Refusal to appear before an examination misconduct or malpractice Committee/Panel	Expulsion
12.	Smuggling of examination question paper out of the examination hall/room while the examination is in progress	Expulsion
13.	Refusal to hand over suspected/incriminating materials	Expulsion
14.	Destruction of suspected/incriminating materials	Expulsion
15.	Failure to return in answer script after an examination	Rustication for two (2) semesters; expulsion at repeat of same offence/misconduct.
16.	Writing before the order to begin or after the student has been ordered to stop writing.	The Supervisor shall deduct 10 marks from the student's work.

For other offenses such as fighting, stealing, indecent dressing, promiscuity and other sexual offenses, insubordination, and inciting violence or rebellion to the management, the culprit will be made to face the Student's Disciplinary Committee.

Conflict Resolution

In the case of any victimization against any student, or extortion, or blackmail, or threat of any degree, or conflicts between a student and another student or other University Community members, the student is encouraged to approach his/her Course Adviser to make a complaint. If he/she is not satisfied with the response, the student may approach the Head of Department. Where the student still feels short changed, the student may approach the Dean of the College, or the Dean of Student Affairs if the matter is not resolved at the College.

For matters involving students' campus life, such complaints may be initiated with the Students' Government, to the Dean of Students Affairs.

SECTION 5

5.1. Agricultural & Biosystem Engineering (B.Eng.) Degree Curriculum

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

100 LEVEL

	100 LEVEL - FIRST SEMESTER				
Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
GET 111	Engineer in Society	1	C	15	-
CHM 113	General Chemistry I	2	C	30	-
CHM 114	General Practical Chemistry I	1	C	-	45
MTH 112	Elementary Mathematics I	2	C	30	-
PHY 111	General Physics III	2	C	30	-
PHY 112	General Physics I	2	C	30	-
PHY 117	General Practical Physics I	1	C	-	45
STA 112	Probability 1	3	C	45	-
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
LIB 116	Use of Library	1	C	15	-
IGB 111	Basic Igbo Literacy	1	C	15	-
FRE 114	Elementary French I	1	E	15	
GER 115	Elementary German I	1	E	15	-
	Total	**20**		**270**	**135**

100 LEVEL - SECOND SEMESTER

Course Code	Course Title	Units	Status	LH	PH
ABE 121	Introduction to Agricultural and Biosystem Engineering	2	C	30	-
GET 121	Design Thinking and Innovation	1	C	15	
GET 122	Engineering Graphics & Solid Modeling I	2	C	15	45
GET 123	Engineering Laboratory 1	1	C	-	45
CHM 121	General Chemistry II	2	C	30	
CHM 124	General Practical Chemistry II	1	C	-	45
MTH 123	Elementary Mathematics III	2	C	30	-
MTH122	Elementary Mathematics II	2	C	30	-
PHY121	General Physics IV	2	C	30	
PHY 122	General Physics II	2	C	30	-
PHY 127	General Practical Physics II	1	C	-	45
ENG 121	Use of English	1	C	15	
IGB 121	Readings and Practice in Igbo	1	C	15	-
FRE 124	Elementary French II	1	E	15	
GER 125	Elementary German II	1	E	15	-
	Total	**20**		**240**	**180**

***E - Electives**

200 LEVEL

200 LEVEL - FIRST SEMESTER					
Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
GET 211	Applied Electricity I	3	C	30	45
GET 212	Engineering Graphics & Solid Modeling II	2	C	15	45
GET 213	Engineering mathematics 1	3	C	45	-
GET 214	Applied Mechanics	3	C	45	-
GET 215	Students Workshop Practice	2	C	15	45
GET 216	Fundamentals of Thermodynamics	3	C	45	-
GST 217	Philosophy, Logic and Human Existence	2	C	30	-
ENT 211	Entrepreneurship and Innovation	2	C	30	-
	Total	**20**		**255**	**135**

200 LEVEL - SECOND SEMESTER

Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
ABE 221	Fundamentals of Agricultural Mechanization and Farm Equipment	2	C	30	-
ABE 222	Soil Mechanics for Agricultural Engineers I	1	C	15	-
GET 221	Computing and Software Engineering	3	C	30	45
GET 222	Engineering Materials	3	C	45	-
GET 223	Engineering Mathematics II	3	C	45	-
GET 224	Strength of Materials	3	C	45	-
GET 225	Fundamentals of Fluid Mechanics	3	C	45	-
GET 226	Electrical and Electronics Engineering Laboratory	1	C	-	45

GET 227	Engineering Laboratory 11	1	C	-	45
*GET 299	SIWES 1	3	C	9 weeks	
	Total	**20**		**225**	**135**

*** All SIWES credited in the 2nd Semester of 400-Level**

300 LEVEL

300 LEVEL - FIRST SEMESTER					
Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
ABE 311	Design of Machine & Structural Elements	2	C	15	45
ABE 312	Crop Production	2	C	30	-
ABE 313	Soil Science	2	C	30	-
ABE 314	Biosystems Engineering	2	C	30	-
GET 311	Engineering Statistics and Data , Analysis	3	C	45	-
GET 312	Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies	2	C	30	-
GET 313	Engineering Mathematics III	3	C	45	-
GET 314	Engineering Laboratory III	1	C	-	45
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
	Total	**21**		**270**	**135**

300 LEVEL - SECOND SEMESTER

Course Code	Course Title	Units	Status	LH	PH
ABE 321	Animal production	2	C	30	-
ABE 322	Land Surveying & Geographic Information system	2	C	15	45
ABE 323	Rural Infrastructural Engineering	2	C	30	-
ABE 324	Farm management, Rural Sociology and Agricultural Extension	2	C	30	-
GET 321	Engineering Economics	3	C	45	
GET 322	Technical Writing and Communication	3	C	45	-
GET 323	Engineering Mathematics IV	3	C	45	-
GET 324	Renewable Energy Systems & Technology	3	C	30	45
*GET 399	SIWES 1I	4	C	12 weeks	
	Total	**20**		**270**	**90**

All SIWES credited in the 2nd Semester of 400-Level, *E- elective

400 LEVEL

400 LEVEL - FIRST SEMESTER					
Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
ABE 411	Instrumentation & Measurement in Agricultural and Biosystems Engineering	2	C	15	45
ABE 412	Engineering Properties and Material Handling of Bio- Materials	2	C	30	-
ABE 413	Agro-resources Structures and Environmental Control	2	C	30	-
ABE 414	Irrigation and Drainage Principles	2	C	30	
ABE 415	Engineering Hydraulics	2	C	30	30

ABE 416	Field Operation and management of Farm Power & Machinery	2	C	15	45
ABE 417	Soil and Water Conservation Engineering	2	C	30	-
ABE 418	Alternative Energy Application to Agriculture	2	C	30	-
ABE 419	Soil Mechanics for Agricultural Engineers II	2	C	30	-
	Total	**18**		**240**	**120**

400 LEVEL - SECOND SEMESTER

Course Code	Course Title	Units	Status	LH	PH
ABE 421	Agricultural and Biosystem Engineering Laboratory Practical	1	C	-	45
*GET 299	SIWES 1	3	C	9 weeks	
*GET 399	SIWES II	4	C	12 weeks	
*GET 499	SIWES III	4	C	12 weeks	
GET 421	Engineering Project I	2	C	-	90
GET 422	Engineering Valuation and Costing	2	C	30	-
	Total	**16**		**30**	**120**

***All SIWES credited in the 2nd Semester of 400-Level**

500 LEVEL

	500 LEVEL - FIRST SEMESTER				
Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
ABE 511	Environmental & Social Impact Analysis	2	C	30	-
ABE 512	Livestock Production Engineering	2	C	30	-
ABE 513	Drone & Robot Technology in Agriculture	2	C	30	30
ABE 514	Mechanization and Integrated Agricultural Production System	2	C	30	-
ABE 515	Crop/Food Processing and Storage of Agricultural Materials	2	C	30	30
ABE 516	Hydrology	2	C	30	
ABE 517	Agro-resources Transportation and Ergonomics	2	*E	30	-
ABE 518	Agricultural Land Drainage	2	*E	30	-
ABE 519	Land Clearing and Development	2	*E	30	-
**ABE 599	B. Eng. Project	2	*C	15	90
GET 511	Engineering Project Management	3	C	45	-
GET 512	Engineering law	2	C	30	-
	Total	**17**		**225**	**150**

500 LEVEL - SECOND SEMESTER

ABE 521	Aquaculture & Agroponics Engineering	2	C	30	
ABE 522	Design of Agro-resources Machinery	2	C	30	-
ABE 523	Farm and Rural Electrification	2	C	15	-
ABE 524	Green house Technology	2	C	30	-
ABE 525	Tractor & Automotive Management	1	C	15	45
ABE 526	Packaging and Containerization Engineering	1	C	15	-
ABE 527	Foundation Engineering	2	*E	30	-
ABE 528	Rural Water Supply and Sanitation	2	*E	30	
ABE 529	Agro- Resources Power Machinery System Management	2	*E	30	-
**ABE 599	B. Eng. Project	2	C	15	90
GET 521	Engineering Management	3	C	45	-
	Total	**17**		**180**	**135**

****ABE 599 Credited in the 2nd Semester of 500-Level**

COURSE' SYNOPSIS

100-Level Courses

GET 111: Engineer in Society (1 Unit C: LH 15)
Learning Outcomes
At the end of this course, the students should be able to:

i. Differentiate between science, engineering and technology, and relate them to innovation;
ii. Distinguish between the different cadres of engineering – engineers, technologists, technicians and craftsmen and their respective roles and competencies;
iii. Identify and distinguish between the relevant professional bodies in engineering;
iv. Categorise the goals of global development or sustainable development goals (SDGS); and
v. Identify and evaluate safety and risk in engineering practice.

Course Contents
History, evolution and philosophy of science. engineering and technology. The engineering profession – engineering family (engineers, technologists, technicians and craftsmen), professional bodies and societies. Engineers' code of conduct and ethics, and engineering literacy. Sustainable development goals (SDGs), innovation, infrastructures and nation building - economy, politics, business. Safety and risk analysis in engineering practice. Engineering competency skills – curriculum overview, technical, soft and digital skills. Guest seminars and invited lectures from different engineering professional associations.

CHM 113: General Chemistry I (2 Units C: LH 30)
Learning Outcomes
At the end of this course, the students should be able to:

i. Define atom, molecules and chemical reactions;
ii. Discuss the modern electronic theory of atoms;
iii. Write electronic configurations of elements on the periodic table;

iv. Rationalise the trends of atomic radii, ionisation energies, electronegativity of the elements, based on their position in the periodic table;
v. Identify and balance oxidation–reduction equation and solve redox titration problems;
vi. Draw shapes of simple molecules and hybridised orbitals;
vii. Identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
viii. Apply the principles of equilibrium to aqueous systems using le chatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
ix. Analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and determine rates of reactions and its dependence on concentration, time and temperature

Course Contents

Atoms, molecules, elements and compounds, and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridisation and shapes of simple molecules. Valence forces; Structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 114: General Practical Chemistry I (1 Unit C: PH 45)

Learning Outcomes

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

i. State the general laboratory rules and safety procedures;
ii. Collect scientific data and correct carry out chemical experiments;
iii. Identify the basic glassware and equipment in the laboratory;
iv. State the differences between primary and secondary standards;
v. Perform redox titration;
vi. Record observations and measurements in the laboratory notebooks; and
vii. Analyse the data to arrive at scientific conclusions.

Course Contents

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

MTH 112: Elementary Mathematics I (2 Units C: LH 30)

Learning Outcomes

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

i. Define and explain set, subset, union, intersection, complements, and demonstrate the use of Venn diagrams;
ii. Solve quadratic equations;
iii. Solve trigonometric functions;
iv. Identify various types of numbers; and
v. Solve some problems using binomial theorem.

Course Contents

Elementary set theory, subsets, union, intersection, complements, Venn diagrams. Real numbers, integers, rational and irrational numbers. Mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem, complex numbers, algebra of complex numbers, the argand diagram. De-Moiré's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

PHY 111: General Physics III (2 Units C: LH 30)

Learning Outcomes

On completion, the students should be able to:

i. Explain the concepts of heat and temperature and relate the temperature scales;
ii. Define, derive and apply the fundamental thermodynamic relations to thermal systems;
iii. Describe and explain the first and second laws of thermodynamics, and the concept of entropy;
iv. State the assumptions of the kinetic theory and apply techniques of describing macroscopic behaviour;
v. Deduce the formalism of thermodynamics and apply it to simple systems in thermal equilibrium; and
vi. Describe and determine the effect of forces and deformation of materials and surfaces.

Course Contents

Heat and temperature, temperature scales; gas laws; general gas equation; thermal conductivity; first Law of thermodynamics; heat, work and internal energy, reversibility; thermodynamic processes; adiabatic, isothermal, isobaric; second law of thermodynamics; heat engines and entropy, Zero's law of thermodynamics; kinetic theory of gases; molecular collisions and mean free path; elasticity; Hooke's law, Young's shear and bulk moduli; hydrostatics; pressure, buoyancy, Archimedes' principles; Bernoullis equation and incompressible fluid flow; surface tension; adhesion, cohesion, viscosity, capillarity, drops and bubbles.

PHY 112: General Physics I (2 Units C: LH 30)

Learning Outcomes

On completion, the students should be able to:

i. Identify and deduce the physical quantities and their units;
ii. Differentiate between vectors and scalars;
iii. Describe and evaluate motion of systems on the basis of the fundamental laws of mechanics;
iv. Apply Newton's laws to describe and solve simple problems of motion;
v. Evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
vi. Explain and apply the principles of conservation of energy, linear and angular momentum;
vii. Describe the laws governing motion under gravity; and
viii. Explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents

Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton's laws of motion (inertial frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits.

PHY 117: General Practical Physics I (1 Unit C: PH 45)

Learning Outcomes

On completion, the student should be able to:

i. Conduct measurements of some physical quantities;
ii. Make observations of events, collect and tabulate data;
iii. Identify and evaluate some common experimental errors;
iv. Plot and analyse graphs; and draw conclusions from numerical and graphical analysis of data

Course Contents

This introductory course emphasizes quantitative measurements. Experimental techniques. The treatment of measurement errors. Graphical analysis. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc. (covered in PHY 112, 111, 103 and PHY 104). However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

STA 112: Probability I (3 Units C: LH 45)

Learning Outcomes

At the end of the course students should be able to

i. Explain the differences between permutation and combination;
ii. Explain the concept of random variables and relate it to probability and distribution functions;
iii. Describe the basic distribution functions; and
iv. Explain the concept of exploratory data analysis.

Course Contents

Permutation and combination. Concepts and principles of probability. Random variables. Probability and distribution functions. Basic distributions: Binomial, geometric, Poisson, normal and sampling distributions; exploratory data analysis.

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

Learning Outcomes

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

i. Identify possible sound patterns in English Language;
ii. List notable language skills; 3. classify word formation processes;

iii. Construct simple and fairly complex sentences in English;
iv. Apply logical and critical reasoning skills for meaningful presentations;
v. Demonstrate an appreciable level of the art of public speaking and listening; and
vi. Write simple and technical reports.

Course Contents

Sounds and sound patterns in English Language (vowels and consonants, phonetics and phonology); English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations); major word formation processes; the sentence in English (types: structural and functional); grammar and usage (tense, concord and modality). Reading and types of reading, comprehension skills, 3RsQ. Logical and critical thinking; reasoning methods (logic and syllogism, inductive and deductive argument, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities (pre-writing (brainstorming and outlining), writing (paragraphing, punctuation and expression), post- writing (editing and proofreading). Types of writing (summary, essays, letter, curriculum vitae, report writing, note-making). Mechanics of writing. Information and Communication Technology in modern language learning. Language skills for effective communication. The art of public speaking.

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

Learning Outcomes

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

i. Analyse the historical foundation of Nigerian cultures and arts in pre colonial times;
ii. Identify and list the major linguistic groups in Nigeria;
iii. Explain the gradual evolution of Nigeria as a political entity;
iv. Analyse the concepts of trade and economic self-reliance of Nigerian peoples in relation to national development;
v. Enumerate the challenges of the Nigerian state regarding nation building;
vi. Analyse the role of the judiciary in upholding fundamental human rights
vii. Identify the acceptable norms and values of the major ethnic groups in Nigeria; and 8. List possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

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

LIB 116: Use of Library (1 Unit C: LH 15)

Learning Outcomes

Upon successful completion of the course, students should be able to:

i. Explain the historical development and role of libraries in education and research.
ii. Differentiate between types of libraries and the resources they offer.
iii. Demonstrate effective library study techniques and research skills.
iv. Utilize both physical and electronic library resources effectively.
v. Apply basic cataloguing and classification principles for locating materials.
vi. Conduct academic research using digital tools and databases.
vii. Properly cite sources using standard bibliographic referencing styles.

viii. Identify and avoid plagiarism in academic writing.
ix. Understand and apply copyright regulations in research and academic work.
x. Perform structured web-based and internet research for academic purposes.

Course Content

Introduction and Historical Background of Libraries: Evolution and significance of libraries, The role of libraries in education and research, The Michael Okpara University of Agriculture, Umudike Library system. Types of Libraries and Their Resources: Academic, public, special, and national libraries, Print and non-print materials, Digital and electronic resources. Library and Education: The relationship between libraries and academic success, Role of the library in self-directed learning, Enhancing research and innovation through libraries. Library Study Skills: Note-taking and summarization techniques, Effective reading and comprehension strategies, Time management for academic success. Library Resources and Organization: Structure of an academic library, Arrangement and classification of resources, The role of librarians in information management. Using Library Resources: Print and Electronic: Accessing books, journals and reference materials, Digital libraries and online repositories, Utilizing institutional e-learning resources. Library Search, Cataloguing and Classification Schemes: The Dewey decimal classification (DDC), The Library of Congress Classification (LCC), OPAC (Online Public Access Catalogue) and other search tools. Databases and Digital Research Tools: Introduction to academic databases (e.g., Google Scholar, JSTOR, ResearchGate, etc.), Open access journals and institutional repositories. Evaluating sources for credibility and reliability. Research Writing and Academic Techniques: Structuring academic papers and reports, Formulating research questions, Literature review techniques. Bibliographic Citation and Referencing Methods: APA, MLA, Chicago, and Harvard citation styles, Managing citations with software tools (e.g., Mendeley, Zotero, EndNote), The importance of proper referencing in academic writing. Plagiarism and Academic Integrity: Understanding plagiarism and its consequences, Techniques for paraphrasing and summarizing, Ethical considerations in research. Copyright Laws and Intellectual Property Rights: Understanding copyright regulations, Fair use policies and restrictions, Copyright implications in academic research. Conducting Internet and Web-Based Research: Effective internet search strategies, evaluating online sources for accuracy and reliability. The role of artificial intelligence and search engines in research

IGB 111: Basic Igbo Literacy (1 Unit C: LH 15)

Learning Outcomes

i. Upon successful completion of the course, students should be able to:
ii. Recognize and correctly pronounce Igbo language alphabets.
iii. Read and pronounce Igbo language texts correctly.
iv. Construct and interpret sentences.
v. Understand the structured learning path from elementary to advanced levels of Igbo language studies

Course Contents

Igbo alphabets, Parts of speech: Nouns and pronouns, Parts of speech: Preposition and conjunctions, Parts of speech: Adjectives, Adverbs and verbs, Interrogatives, numerals and exclamation, Phrases and tones, Clauses, Affixation, Punctuation marks, Sentence types, Morphemes, Igbo literature: Teaching of Igbo culture, Igbo songs and poetry.

FRE 114: Elementary French I (1 Unit *E: LH 15)

Learning Outcomes

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

i. Recognize and correctly pronounce French alphabets and phonetics.
ii. Communicate basic information in French, including greetings and self-introductions.
iii. Read and pronounce French texts correctly.
iv. Construct and interpret elementary sentences.

Course Contents

French Culture and Civilization: Importance of French language in Nigeria, Overview of Francophone countries and their relationship with Nigeria. Knowledge of France: Introduction to France's history and major major cities, Contribution of France to Development of Science, Technology and Agriculture; Medicine and biology; Physics, chemistry and engineering; Agriculture, clothing and Food processing; Mathematics; Arts, communication and Computers; Philosophy. AGRICULTURE (L'AGRICULTURE): Position of France in agricultural produce, Definition of some related agricutral terms, Quelques verbes utilisent dans L'agriculture (Some verbs used in agriculture), Les outils et machines agricols (Some agricultural tools and machines), Some Educational terms in

English and French, Some French verbs associated with education, Informatique et la technologie d'information, Verbs associated with ICT. ENGINEERING (GENIE): Genie Chimique (Chemical Engineering), Genie Electrique (Electrical Enginnering), Mechanical Engineering (Genie Mecanique), Génie Civile (Civil Engineering), Les sciences naturelles, Physiques et Appliques (Natural, Physical and Applied Sciences), La Santé et La Médicine (Health and medicine), L'Economie (Economics), Le Tourisme (Tourism). INTRODUCTION A LA PHONETIQUE (INTRODUCTION TO PHONETICS: The French Alphabet and accents, Spellings and pronunciation, Classroom pronunciation practice. LES SALUTATIONS ET FORMULES DE POLITESSE (GREETINGS AND POLITE REMARKS: Common greetings and self-introduction, Asking about Someone's wellbeing, Introduction of Self and others, (Metiers/Professions) Occupation/professsions, Introducing someone (Presenter quelqu'un), Nationality, Address, place and Date of birth, Countries and their nationals, (residential Address) Domicile, (Place of birth) lieu de naissance, Les nombres: cardinaux et ordinaux (Numbers : cardinal and ordinal), (Telling time, Day, Month, Year, and date) Dire L'heure, Les jours, Les mois et les années). LES OBJETS UTILISESS DANS LA CLASSE, ARTICLES, GENRES, PREPOSITIONS (OBJECTS USED IN THE CLASSROOM, ARTICLES, GENDER AND PREPOSTIONS

GER 115: Elementary German I (1 Unit *E: LH 15)

Learning Outcomes

Upon successful completion of this course, students will:

i. Recognize and correctly pronounce German phonetics and alphabets.
ii. Develop a basic understanding of German grammar and vocabulary
iii. Utilize fundamental grammar structures in writing and conversation.

Course Contents

Introduction to German Language, Pronunciation of German alphabets and special characters (ä, ö, ü, ß), Personal pronouns and auxiliary verbs (sein, haben, werden). Greetings and Personal Information, Common greetings and self-introduction, Asking and answering personal details (name, age, nationality, profession). Numbers, Dates and Time, Counting from 0 to 1 billion, Ordinal numbers and telling time, Days, months, seasons and their significance in agriculture. Articles, Nouns, and Cases, Definite and indefinite articles,

Singular and plural forms, Basic introduction to nominative, accusative, dative and genitive cases.

ABE 121: Introduction to Agricultural and Biosystems Engineering (2 Units C: LH 30)

The course exposes fresh students to:

i. The contents of agricultural and biosystems engineering;
ii. The diverse role and relevance of the agricultural engineering profession;
iii. The career opportunities; and
iv. Appreciate the strategic importance of agricultural engineering in supporting and sustaining agricultural production.

Course Contents

Philosophy and evolution of agricultural and biosystems engineering. The role of Agricultural and Biosystems Engineers in the society and human development. The relationship between agricultural and biosystems engineering and the other engineering disciplines. Significance of agricultural and biosystems engineering. Introduction to agricultural and biosystems engineering: farm power and machinery engineering; soil and water engineering; crop processing and storage engineering; farm structures and environment engineering; biosystems engineering. ABE and sustainable development. The global development goals (SDGs). Climate change impacts on agriculture, adaptation and mitigation measures; Climate smart agriculture. Career opportunities in agricultural and biosystems engineering.

GET 121: Design Thinking and Innovation (1 Unit C: LH 15)

Learning Outcomes

Upon completion of this course, graduates will be able to:

i. Interpret established Design Thinking theories, concepts and processes, as well as analyze new directions in the field;
ii. Apply user centered research methods that appropriately respond to an area of practice to generate a solution to a specific real-world problem;
iii. Communicate an understanding of various problem-solving methods and their relationship to Design Thinking strategies;
iv. Collaborate effectively in group-based work;
v. Break cognitive fixedness and approach problems with a new mindset that integrates creative problem-solving and management; and

vi. Put design thinking into action by collaborating with peers from a wide range of professional experiences and backgrounds.

Course Contents

Introduction to Design and Problem Solving in Engineering. Principles of Teamwork and Collaboration in Design. Breaking down complex Engineering problems. The Engineering Design Process: From Need to Concept. Problem Definition and Stakeholder Analysis. Brainstorming, Ideation, and Concept Selection. Modeling and Prototyping Techniques (Sketching, CAD, Simulations). Team Presentations on Concept Development. Systems Thinking and Integration in Mechatronic Design. Design Thinking suite of methods and techniques applied to project lifecycles with an emphasis on interdisciplinary practice. Ethical and Social Impact of Engineering Solutions. Final Project Work and Peer Feedback. Final Team Presentations and Design Review.

GET 122: Engineering Graphics and Solid Modelling I (2 Units C: LH 15; PH 45)

Learning Outcomes

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

i. Have a good grasp of design thinking and be obsessed with the determination to apply such to solving simple every day and also complex problems;
ii. Recognise the fundamental concepts of engineering drawing and graphics;
iii. Show skills to represent the world of engineering objects in actionable solid models, and put such models in a form where they can be inputs for simulation and analyses;
iv. Analyse such models for strength and cost;
v. Prepare the objects for modern production and manufacturing techniques of additive and subtractive manufacturing;
vi. Recognise that engineering is multidisciplinary in the sense that mechanical, electrical and other parts of physical structures are modeled in context as opposed to the analytical nature of the courses they take and
vii. Analyse and master the basics of mechanical and thermal loads in engineering systems.

Course Contents

Introduction to design thinking and engineering graphics. First and third angle orthogonal projections. Isometric projections; sectioning, conventional

practices, conic sections and development. Freehand and guided sketching – pictorial and orthographic. Visualisation and solid modelling in design, prototyping and product-making. User interfaces in concrete terms. Design, drawing, animation, rendering and simulation workspaces. Sketching of 3D objects. Viewports and sectioning to shop drawings in orthographic projections and perspectives. Automated viewports. Sheet metal and surface modelling. Material selection and rendering. This course will use latest professional design tools such as fusion 360, solid works, solid edge or equivalent.

GET 123: Engineering Laboratory I (1 Unit C: PH 45)

Learning Outcomes

Upon successful completion of the course, students will be able to:

i. Understand and apply the scientific method and engineering experimental procedures;
ii. Perform measurements and data acquisition using basic laboratory instruments;
iii. Analyze and interpret experimental data using appropriate mathematical and statistical tools;
iv. Write clear, structured technical lab reports and communicate findings effectively;
v. Demonstrate proper lab safety, teamwork, and professional conduct; and
vi. Understand the physical principles underlying simple mechatronics systems.

Course Contents

Introduction to Laboratory Practices, Safety Procedures, and Report Writing. Measurement Techniques and Error Analysis (Length, Mass, Volume, Time, Temperature). Use of Vernier Calipers, Micrometers, and Multimeters. Force, Equilibrium, and Vector Analysis. Newton's Laws and Friction. Oscillations and Simple Harmonic Motion. Ohm's Law and Series/Parallel Circuits. Kirchhoff's Laws and Network Theorems. Basic Data Acquisition: Introduction to Sensors and Arduino. Arduino IDE installation and basics. Hydrostatic Pressure and Bernoulli's Principle. Stress-Strain Relationship. Thermal Conductivity and Heat Loss. Basic Signal Measurement: Oscilloscope and Signal Generator Use. Overview of robotics components. DC motor and servo motor control using motor drivers (e.g., L298N). Final Report Submission and Review.

CHM 121: General Chemistry II (2 Units C: LH 30)

Learning Outcomes

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

i. State the importance and development of organic chemistry;
ii. Define fullerenes and its applications; 3. Discuss electronic theory;
iii. Determine the qualitative and quantitative of structures in organic chemistry;
iv. State rules guiding nomenclature and functional group classes of organic chemistry; 6. Determine the rate of reaction to predict mechanisms of reaction;
v. Identify classes of organic functional group with brief description of their chemistry; 8. Discuss comparative chemistry of group 1a, iia and iva elements; and
vi. Describe basic properties of transition metals.

Course Contents

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

CHM 124: General Practical Chemistry II (1 Unit C: PH 45)

Learning Outcomes

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

i. State the general laboratory rules and safety procedures;
ii. Collect scientific data and correctly carry out chemical experiments;
iii. Identify the basic glassware and equipment in the laboratory;
iv. Identify and carry out preliminary tests which include ignition, boiling point, melting point, test on known and unknown organic compounds;

v. Carry out solubility tests on known and unknown organic compounds;
vi. Carry out elemental tests on known and unknown compounds; and
vii. Carry out functional group/confirmatory test on known and unknown compounds which could be acidic/basic/ neutral organic compounds.

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

MTH 122: Elementary Mathematics II (2 Units C: LH 30)
Learning Outcomes
At the end of the course, students should be able to:
i. Identify the types of rules in differentiation and integration;
ii. Recognise and understand the meaning of function of a real variable, graphs, limits and continuity;
iii. Solve some applications of definite integrals in areas and volumes;
iv. Solve function of a real variable, plot relevant graphs, identify limits and idea of continuity;
v. Identify the derivative as limit of rate of change;
vi. Identify techniques of differentiation and perform extreme curve sketching;
vii. Identify integration as an inverse of differentiation;
viii. Identify methods of integration and definite integrals; and
ix. Perform integration application to areas, volumes.

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

MTH 123: Elementary Mathematics III (2 Units C: LH 30)

Learning Outcomes

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

i. Solve some vectors in addition and multiplication;
ii. Calculate force and momentum; and
iii. Solve differentiation and integration of vectors.

Course Contents

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

PHY 121: General Physics IV (2 Units C: LH 30)

Outcomes

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

i. Describe and quantitatively analyse the behaviour of vibrating systems and wave energy;
ii. Explain the propagation and properties of waves in sound and light;
iii. Identify and apply the wave equations; and explain geometrical optics and principles of optical instruments

Course Contents

Simple harmonic motion (SHM). Energy in a vibrating system. Damped SHM. Resonance and transients. Coupled SHM. Q values and power response curves. Normal modes. Waves (types and properties of waves as applied to sound). Transverse and longitudinal waves (superposition, interference, diffraction, dispersion, polarization). Waves at interfaces (energy and power of waves). The wave equation. 2-D and 3-D wave equations. Wave energy and power. Phase and group velocities. Echo and beats. The Doppler-effect. Propagation of sound in gases, solids and liquids and their properties. Optics: Nature and propagation of light. Reflection and refraction. Internal reflection. Scattering of light.

Reflection and refraction at plane and spherical surfaces. Thin lenses and optical instruments. Wave nature of light. Dispersion. Huygens's principle (interference and diffraction).

PHY 122: General Physics II (2 Units C: LH 30)

Learning Outcomes

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

i. Describe the electric field and potential, and related concepts, for stationary charges;
ii. Calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
iii. Describe and determine the magnetic field for steady and moving charges;
iv. Determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
v. Describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
vi. Explain the basic physical significance of Maxwell's equations in integral form;
vii. Evaluate DC circuits to determine the electrical parameters; and
viii. Determine the characteristics of AC voltages and currents in resistors, capacitors, and Inductors.

Course Contents

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

PHY 127: **General Practical Physics II** **(1 Unit C: PH 45)**

Learning Outcomes

On completion, the student should be able to:

i. Conduct measurements of some physical quantities;
ii. Make observations of events, collect and tabulate data;
iii. Identify and evaluate some common experimental errors;
iv. Plot and analyse graphs;
v. Draw conclusions from numerical and graphical analysis of data; and
vi. Prepare and present practical reports.

Course Contents

This practical course is a continuation of PHY 117 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements, the treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

ENG 121: Use of English **(1 Unit C: LH 15)**

Learning Outcomes

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

i. Comprehend and utilize vocabulary relevant to diverse fields
ii. Identify and correctly apply various figures of speech in writing and speech.
iii. Demonstrate competence in writing formal and informal letters, essays, reports, and articles.
iv. Critically analyze and review literary texts
v. Understand and apply phonetic principles for clear and effective oral communication.

Course Contents

Vocabulary Development: Exploring registers and levels of usage in different fields such as medicine, military, communication, marketing, Law, Literature, Agriculture and Sciences, Direct and indirect speech. Figures of speech: Understanding and application of smile, metaphor, personification, apostrophe, metonymy, synecdoche, hyperbole, climate, euphemism, irony, paradox and oxymoron. Writing Skills: Letter writing - formal, informal, semi-

formal, Essay writing, Report writing, Article writing, letters to editors and speech writing techniques. Book Review: A literary book will be assigned at the beginning of the semester. Discussions and reviews to be guided by the instructor. Oral Communication: Introduction to Phonetics and Phonology. ii)Classification of speech sounds: vowels and consonants. Understanding syllables: mono- syllabic, di- syllabic and multi - syllabic words. Mastering stress and intonation patterns. This course is structured to provide students with essential English language skills necessary for academic success and professional communication in their respective disciplines.

IGB 121: Readings and Practice in Igbo (1 Unit C: LH 15)

Learning Outcomes

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

i. Understand fundamental aspects of Igbo language linguistics, literature and culture to enhance appreciation and competence.
ii. Apply Igbo language and communication skills effectively to diverse fields; social, political and economic contexts
iii. Develop strategies for independent Igbo language learning and resource utilization.

Course contents

Essay writing, Figures of speech, Traditional literature, Written literature, Translations and Dictionaries in Igbo, Test, Igbo indigenous knowledge, Speech writing, Comprehension, poetry or drama, Research in Igbo within the university, Using computer to write Igbo.

FRE 124: Elementary French II (1 Unit *E: LH 15)

Learning Outcomes

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

i. Communicate in basic French for everyday interactions.
ii. Identify cultural differences and similarities between French speaking and non-French-speaking countries.
iii. Apply French in academic and professional contexts.

Course Contents

LES VERBES ET LES ADVERBES FRANCAIS (FRENCH VERBS AND ADVERBS). CONSTRUCTION DES PHRASES FRANCAISES (FRENCH SENTENCE

CONSTRUCTION). Introduction to essential verbs (être, avoir, aller, aimer). Present tense conjugation and sentence construction. Sentence Formation and Communication. EXPRIMER LES ACTIVITES QUOTIDIEN (DAILY ACTIVITY EXPRESSIONS. -Sentence Formation and Communication. Using adjectives, pronouns, and common expressions. Everyday vocabulary and basic sentence structures. Engaging in basic conversations and describing daily activities. LES ADJECTIFS POSSESSIFS (POSSESSIVE ADJECTIVES).

GER 125: Elementary German II (1 Unit *E: LH 15)

Learning Outcomes

Upon successful completion of this course, students will:

i. Engage in simple dialogues related to daily life, education and work.
ii. Identify cultural differences and similarities between Nigeria and German-speaking countries.
iii. Apply German language skills in understanding research materials and global marketing trends.

Course Contents

Verbs – Modal, Separable and Inseparable. Modal verbs and their applications. Separable and inseparable verb prefixes. Family, Professions and Descriptive Adjectives. Vocabulary for family structures. Identifying professions and their gender forms. Adjective declension and sentence construction. The Human Body, Colors and Opposites. Naming body parts and their functions. Understanding and using colors in different contexts. Common antonyms and contrasting words.

200-LEVEL COURSES

GET 211: Applied Electricity I (3 Units C: LH 30; PH 45)

Learning Outcomes

Students will be able to:

i. Discuss the fundamental concepts of electricity and electrical d.c. circuits;
ii. State, explain and apply the basic d.c. circuit theorems;
iii. Explain the basic a.c. circuit theory and
iv. Apply to solution of simple circuits.

Course contents

Fundamental concepts: Electric fields, charges, magnetic fields. Current, B-H curves Kirchhoff's laws, superposition. Thevenin Norton theorems, Reciprocity, RL, RC, RLC circuits. DC, AC bridges, Resistance, Capacitance, Inductance measurement, Transducers, Single phase circuits, Complex j - notation, AC circuits, impedance, admittance and susceptance.

GET 212: Engineering Graphics and Solid Modeling II (2 Units C: LH 15; PH 45)

Learning Outcomes

Students should be able to:

i. Apply mastery of the use of projections to prepare detailed working drawing of objects and designs;

ii. Develop skills in parametric design to aid their ability to see design in the optimal specification of materials and systems to meet needs;

iii. Be able to analyze and optimize designs on the basis of strength and material minimization;

iv. Get their appetites wet in seeing the need for the theoretical perspectives that create the basis for the analysis that are possible in design and optimization, and recognize/understand the practical link to excite their creativity and ability to innovate; and

v. Be able to translate their thoughts and excitements to produce shop drawings for multi-physical, multidisciplinary design.

Course Contents

Projection of lines, auxiliary views and mixed projection. Preparation of detailed working production drawing; semi-detailed drawings, conventional presentation methods. Solid, surface and shell modeling. Faces, bodies and surface intersections. Component-based design. Component assembly and motion constraints. Constrained motions and animation. Introduction to electronics modeling. Electronics board layout preparation, Component libraries and Schematic design. Parametric modeling and adaptive design. Simulation for material optimization. Designing for manufacturing. Additive and subtractive manufacturing. Production for 3-D printing, Laser cutting and CNC machinery. Arrangement of engineering components to form a working plant (Assembly Drawing of a Plant).

GET 213: Engineering Mathematics I (3 Units C: LH 45)

Learning Outcomes

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

i. Solve qualitative problems based on vector and matrix analyses such as linear independence and dependence of vectors, rank etc;

ii. Describe the concepts of limit theory and nth order differential equations and their applications to physical phenomena;

iii. Solve the problems of differentiation of functions of two variables and know about the maximization and minimization of functions of several variables;

iv. Describe the applications of double and triple integration in finding the area and volume of engineering solids, and explain the qualitative applications of Gauss, Stoke's and Green's theorem;

v. Explain ordinary differential equations and applications, and develop a mathematical model of linear differential equations, as well as appreciate the necessary and sufficient conditions for total differential equations; and

vi. Analyse basic engineering models through partial differential equations such as wave equation, heat conduction equation, etc., as well as Fourier series, initial conditions and its applications to different engineering processes.

Course Contents

Limits, continuity, differentiation, introduction to linear first order differential equations, partial and total derivatives, composite functions, matrices and determinants, vector algebra, vector calculus, directional derivatives.

GET 214: Applied Mechanics (3 Units C: LH 45)

Learning Outcomes

Students will acquire the ability to:

i. Explain the fundamental principles of applied mechanics, particularly equilibrium analysis, friction, kinematics and momentum;

ii. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, mathematics and applied mechanics;

iii. Synthesize Newtonian Physics with static analysis to determine the complete load impact (net forces, shears, torques, and bending moments) on all components (members and joints) of a given structure with a load; and

iv. Apply engineering design principles to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Course Contents

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

GET 215: Students Workshop Practice (2 Units C: LH 15; PH 45)

Learning Outcomes

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

i. Identify various basic hands and machine tools, analogue and digital measurement devices and instruments, and acquire skills in their effective use and maintenance;

ii. Practically apply basic engineering technologies, including metrology, casting, metal forming and joining, materials removal, machine tooling (classification, cutting tool action, cutting forces, non-cutting production) and CNC machining technology;

iii. Master workshop and industrial safety practices, accident prevention and ergonomics;

iv. Physically recognise different electrical & electronic components like resistances, inductances, capacitances, diodes, transistors and their ratings;

v. Connect electric circuits, understand different wiring schemes, and check ratings of common household electrical appliances and their basic maintenance; and

vi. Determine household and industrial energy consumption, and understand practical energy conservation measures.

Course Contents

The course comprises general, mechanical and electrical components: supervised hands-on experience in safe usage of tools and machines for selected tasks; Use of measuring instruments (calipers, micrometers, gauges, sine bar, wood planners, saws, sanders, and pattern making). Machine shop: lathe work shaping, milling, grinding, reaming, metal spinning. Hand tools, gas and arc welding, cutting, brazing and soldering. Foundry practice. Industrial safety and accident prevention, ergonomics, metrology. Casting processes. Metal forming processes: hot-working and cold-working processes (forging, press-tool work, spinning, etc.). Metal joining processes(welding, brazing and soldering). Heat treatment. Material removal processes. machine tools and classification. Simple theory of metal cutting. Tool action and cutting forces. Introduction to CNC machines. Supervised identification, use and care of various electrical and electronic components such as resistors, inductors, capacitors, diodes and transistors. Exposure to different electric circuits, wiring schemes, analogue and digital electrical and electronic measurements. Household and industrial energy consumption measurements. Practical energy conservation principles.

GET 216: Fundamentals of Thermodynamics (3 Units C: LH 45)

Learning Outcomes

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

i. Describe basic concepts of thermodynamics, quantitative relations of Zeroth, first, second and third laws;

ii. Define and explain system (surrounding, closed and open system), control volume and control mass, extensive and intensive properties;

iii. Calculate absolute and gage pressure, and absolute temperature, calculate changes in kinetic, potential, enthalpy and internal energy;

iv. Evaluate the properties of pure substances i.e. evaluate the state of the pure substances such as compressed liquid, saturated liquid-vapour mixture and superheated vapour using property diagrams and tables; arrange the ideal and real gas equations of state,

v. Formulate the first law of thermodynamics for a closed system i.e. organize the change in energy in the closed systems via heat and work transfer;

vi. Distinguish heat transfer by conduction, convection and radiation, and calculate the amount of heat energy transferred;
vii. Calculate the changes in moving boundary work, spring work, electrical work and shaft work in closed systems;
viii. Apply the first law of thermodynamics for closed systems and construct conservation of mass and energy equations;
ix. Formulate the first law of thermodynamics to the open systems i.e. describe steady-flow open system, apply the first law of thermodynamics to the nozzles, diffusers, turbines, compressors, throttling valves, mixing chambers, heat exchangers, pipe and duct flow;
x. Construct energy and mass balance for unsteady-flow processes;
xi. Evaluate thermodynamic applications using second law of thermodynamics;
xii. Calculate thermal efficiency and coefficient of performance for heat engine, refrigerators and heat pumps; and
xiii. Restate perpetual-motion machines, reversible and irreversible processes.

Course Contents

Basic concepts, definitions and laws (quantitative relations of Zeroth, first, second and third laws of thermodynamics). Properties of pure substances: the two-property rule (P-V-T behaviour of pure substances and perfect gases); state diagrams. The principle of corresponding state; compressibility relations; reduced pressure; reduced volume; temperature; pseudo-critical constants. The ideal gas: specific heat, polytropic processes. Ideal gas cycles; Carnot; thermodynamic cycles, turbines, steam and gas, refrigeration. The first law of thermodynamics – heat and work, applications to open and closed systems. The steady flow energy equation (Bernoulli's equation) and application. Second law of thermodynamics, heat cycles and efficiencies.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 30)

Learning Outcomes

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

i. Explain the concepts and theories of entrepreneurship, entrepreneurship, opportunity seeking, new value creation and risk-taking;

ii. State the characteristics of an entrepreneur;
iii. Analyze the importance of micro and small businesses in wealth creation, employment generation and financial independence;
iv. Engage in entrepreneurial thinking;
v. Identify key elements in innovation;
vi. Describe the stages in enterprise formation, partnership and networking, including business planning;
vii. Describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world; and
viii. State the basic principles of e-commerce.

Course Contents

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

GST 217: Philosophy, Logic and Human Existence (2 Units C: LH 30)

Learning Outcomes

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

i. Know the basic features of philosophy as an academic discipline;
ii. Identify the main branches of philosophy & the centrality of logic in philosophical discourse;

iii. Know the elementary rules of reasoning;
iv. Distinguish between valid and invalid arguments;
v. Think critically and assess arguments in texts, conversations and day-to-day discussions;
vi. Critically asses the rationality or otherwise of human conduct under different existential conditions;
vii. Develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
viii. Guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

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

ABE 221: Fundamentals of Agricultural Mechanization and Farm Equipment (2 Units: LH 30)

Course Learning Outcome

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

i. Understand the concept, aims, and objectives of agricultural mechanization
ii. Identify and explain the benefits and challenges of agricultural mechanization
iii. Familiarize with agricultural workshop tools and equipment
iv. Understand the principles of power sources used in agricultural machinery, including internal combustion engines and electric motors
v. Identify and describe various agricultural implements and equipment, including tillage, harvesting, processing, livestock, and irrigation equipment
vi. Understand the principles of farm machinery management, including selection, maintenance, costing, and record-keeping

vii. Apply knowledge of farm building structures and surveying equipment to design and manage farm infrastructure

Course content

Meaning of agricultural mechanization, aims and objective of agricultural mechanization, levels of agricultural mechanization, challenges and constraints in agricultural mechanization,; basic concepts and categories of agricultural mechanization; benefits of agricultural mechanization; Introduction to Agricultural workshop tools, Introduction to tillage, principle of internal combustion engine, introduction to different implements used in tillage(Plough, harrow, ridger etc), Principles of electric motors in Agricultural machines, introduction to harvesting and processing and storage equipments , introduction to livestock equipments (automatic feeder, drinkers, Milking and milk handling equipments, meat processing equipments) , introduction to water lifting and irrigation equipment , introduction to surveying equipment used in the farm and the operating principles, selection and maintenance procedure, farm machinery costing and records, Introduction to farm building structures

ABE 222: Soil Mechanics for Agricultural and Biosystems Engineers I (1 Units C: LH 15)

Course Learning Outcome

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

i. Elucidate the Introduction to soil mechanics.
ii. Explain Phase relationship, Permeability Consolidation,
iii. Explain Seepage.
iv. Explain Effective stress principle. Stress distribution in soils.
v. 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, Soil compaction and its effects on soil properties, Shear strength of soils (Mohr-Coulomb theory, triaxial test)

GET 221: Computing and Software Engineering (3 Units C: LH 30; PH 45)

Learning Outcomes

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

i. Describe and apply computing, software engineering knowledge, best practices, and standards appropriate for complex engineering software systems;
ii. Develop competence in designing, evaluating, and adapting software processes and software development tools to meet the needs of an advanced development project through practical object-oriented programming exposure taught in concrete terms with a specific modern language – preferable selected from Python, Java or C++;
iii. Use widely available libraries to prepare them for machine learning, graphics and design simulations;
iv. Develop skills in eliciting user needs and designing an effective software solution;
v. Recognise human, security, social, and entrepreneurial issues and responsibilities relevant to engineering software and the digitalisation of services; and
vi. Acquire capabilities that can further be developed to make them productively employable by means of short Internet courses in specific areas

Course Contents

Introduction to computers and computing; computer organisation – data processing, memory, registers and addressing schemes; Boolean algebra; floating-point arithmetic; representation of non-numeric information; problem-solving and algorithm development; coding (solution design using flowcharts and pseudo codes). Data models and data structures; computer software and operating system; computer operators and operators precedence; components of computer programs; introduction to object oriented, structured and visual programming; use of MATLAB in engineering applications. ICT fundamentals, Internet of Things (IoT). Elements of software engineering.

GET 222: Engineering Materials (3 Units C: LH 45)

Learning Outcomes

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

i. Demonstrate the role of atoms and molecules (aggregates of atoms) in the building of solid/condensed matter known as engineering

materials, the electrons quantum numbers and how the electrons are arranged in different atomic elements, and explain the role of electronic configuration and valence electrons in bonding;

ii. Define metals, alloys and metalloids, demonstrate mental picture of the solid mineral resources development as a relay race among four 'athletes': geologist, mining engineer, mineral processing technologist, process metallurgical engineer, and classify metallurgical engineering into 3ps: process, physical and production;

iii. Explain the relationship between structure and properties of materials, characteristics, components and compositions of phase diagrams and phase transformations of solid solutions;

iv. Define ceramics, glass and constituents of glasses and understand application of ceramics in mining, building, art and craft industries;

v. Define and classify polymers as a class of engineering materials and polymeric materials, demonstrate polymerization reactions, their types and mechanism, and applications of polymers;

vi. Define properties, types and application of composite materials and fibres (synthetic and natural);

vii. Define and classify nanomaterials, demonstrate applications of nanomaterials, concept, design and classification of fracture mechanics, corrosion classification, including the five principal ways of controlling corrosion and metal finishing processes such as sherardising, galvanizing and anodizing; and

viii. Identify factors affecting the performance and service life of engineering materials/metals and metallography of metals/materials (materials anatomy), which enables metallurgical and materials engineers to prescribe appropriate solutions to testmetals/materials fitness in service through structure-property-application relationships.

Course Contents

Basic material science; atomic structure, atomic bonding and crystal structures. Engineering materials situating metals and alloys; metals and alloys, classifications of metals, metal extraction processes using iron and steel (ferrous) and aluminium (nonferrous) as examples, phase diagrams/iron carbon diagrams, and mechanical workings of metals. Selection and applications of metals and alloys for specific applications in oil, aerospace, construction, manufacturing and transportation industries, among others. Ceramics (including glass); definition, properties, structure and classifications of

ceramics. Bioactive and glass – ceramics. Toughing mechanism for ceramics. Polymers; definition of polymers as engineering materials, chemistry of polymeric materials, polymer crystallisation, polymer degradation and aging. Thermoplastic and thermosetting polymers and concepts of copolymers and homopolymers. Composites; definition, classification, characterisation, properties and composite. Applications of composites. Nanomaterials; definition, classification and applications of nanomaterials as emerging technology. Processing of nanomaterials including mechanical grinding, wet chemical synthesis, gas phase synthesis, sputtered plasma processing, microwave plasma processing and laser ablation. Integrity assessment of engineering materials; effect of engineering design, engineering materials processing, selection, manufacturing and assembling on the performance and service life of engineering materials. Metallography and fractography of materials. Mechanical testing (destructive testing) of materials such as compressive test, tensile test, hardness test, impact test, endurance limit and fatigue test. Non-destructive test (NDT) such as dye penetrant, x-ray and eddy current.

GET 223: Engineering Mathematics II (3 Units C: LH 45)

Learning Outcomes

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

i. Describe physical systems using ordinary differential equations (ODEs);
ii. Explain the practical importance of solving ODEs, solution methods, and analytically solve a wide range of ODEs, including linear constant coefficient types;
iii. Numerically solve differential equations using MATLAB and other emerging applications;
iv. Perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion, as well as on functions of several variables, including directional derivatives and multiple integrals;
v. Solve problems using the fundamental theorem of line integrals, Green's theorem, the divergence theorem, and Stokes' theorem, and perform operations with complex numbers;
vi. Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions of complex variables, as well as the theory of conformal mapping to solve

problems from various fields of engineering; and

vii. Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula.

Course Contents

Introduction to ordinary differential equations (ODEs); theory, applications, methods of solution; second order differential equations. Advanced topics in calculus (vectors and vector-valued function, line integral, multiple integral and their applications). Elementary complex analysis including functions of complex variables, limits and continuity. Derivatives, differentiation rules and differentiation of integrals. Cauchy-Riemann equation, harmonic functions, basic theory of conformal mapping, transformation and mapping and its applications to engineering problems. Special functions.

GET 224: Strength of Materials (3 Units C: LH 45)

Learning Outcomes

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

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

Course Contents

Consideration of equilibrium; composite members, stress-strain relation. Generalised Hooke's law. Stresses and strains due to loading and temperature changes. Torsion of circular members. Shear force, bending moments and

bending stresses in beams with symmetrical and combined loadings. Stress and strain transformation equations and Mohr's circle. Elastic buckling of columns.

GET 225: Fundamentals of Fluid Mechanics (3 Units C: LH 45)

Learning Outcomes

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

i. Explain the properties of fluids;
ii. Determine forces in static fluids and fluids in motion;
iii. Determine whether a floating body will be stable;
iv. Determine the effect of various instruments, (valves, orifices, bends and elbows) on fluid flow in pipes;
v. Measure flow parameters with venturi meters, orifice meters, weirs and others;
vi. Perform calculations based on principles of mass, momentum and energy conservation;
vii. Perform dimensional analysis and simple fluid modelling problems; and
viii. Specify the type and capacity of pumps and turbines for engineering applications.

Course Contents

Fluid properties, hydrostatics, fluid dynamics using principles of mass, momentum and energy conservation from a control volume approach. Flow measurements in pipes, dimensional analysis, and similitude, 2-dimensional flows. Hydropower systems.

GET 226: Electrical and Electronic Engineering Laboratory (1 Unit C: PH 45)

Learning Outcomes

i. Verify the various dc and ac network theorems
ii. Perform simple experiments on Resistance, Inductance, and capacitance Measurements.
iii. Measure and determine voltage, current, and power in 3-phase star/delta connections.
iv. Identify dc generator excitation methods and load characteristics of a separately excited dc motor
v. Perform open and short circuit tests of a transformer

Course Content

Resistance measurement; Condition for maximum power transfer; inductance and capacitance measurement; verification of network theorems; ac series

circuits. Measurement of power and power factor, excitation of dc generator, load characteristics of a separately excited dc motor; open and short circuit tests for a transformer. Static characteristics of junction diode and transistor, Half and full wave rectification, determination of copper temperature coefficient by Wheatstone bridge, measurement of voltage, current, and power in three phase star/delta connection, simple domestic installation practices.

GET 227: Engineering Laboratory II (1 Unit C: PH 45)

Learning Outcome

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

i. Determine the thermal conductivity of a given insulating material and metal rod;
ii. Determine calorific values of coal and coke;
iii. Study the flow of fluids through obstacles;
iv. Determine young's Modulus of material;
v. Explain the melt mass flow rate MFR of Engineering materials;
vi. Evaluate calorific value of coke using Bomb Calorimeter, proximate Analysis of coal and coke;
vii. Modify the microstructure and mechanical properties of materials for improved performance in engineering applications;
viii. Evaluate composite materials for enhanced structural and functional performance in engineering applications;
ix. Understand the mechanisms of material degradation and perform tests to evaluate corrosion behavior and resistance for material selection and protection strategies; and
x. Experimentally investigate and analyze energy conversion processes, validate thermodynamic principles and enhance understanding of system behavior under various thermal conditions.

Course Contents

Crystal structure of selected specimen (BCC, FCC, HCP). Crystal imperfection. Determination of solidification curve of selected metals. Heat treatment

processes (annealing, normalizing). Heat treatment processes hardening and tempering. Microstructural examination of mild steel. Commination devices. Pneumatic conveying system for solids. Use of cyclone to separate solids from air stream. Introduction to different types of screening equipment. Determination of the thermal conductivity of a metallic rod. Determination of the thermal conductivity of an insulating powder. Determination of the thermal conductivity of a solid by the guarded hot plate method. Verification of the Stefen-Boltzmann constant for thermal conductivity. Mechanical test: Impact test, Tensile test, Hardness test, Fatigue test, Creep and Non-destructive test of engineering materials, testing of magnetic materials e.g. transformer cores, testing of insulators, cables and transformers coil and verification of P-N junction characteristics. Tensile tests on bars. Determination of young's modulus of rigidity of materials of close coiled helical spring and stiffness of spring. Radiation resistant spring. Proximate analysis and determination of the calorific value of coal and coke using Bomb Calorimeter. Composite materials, corrosion testing, entropy change during reversible and irreversible processes using heat exchanger.

GET 299: Students Industrial Work Experience I (3 Units C: 9 Weeks)

Learning Outcomes

SIWES I should provide opportunity for the students to:

i. Acquire industrial workplace perceptions, ethics, health and safety consciousness, inter-personal skills and technical capabilities needed to give them a sound engineering foundation;
ii. Learn and practise basic engineering techniques and processes applicable to their specialisations;
iii. Build machines, devices, structures or facilities relevant to their specific engineering programmes and applications; and
iv. Acquire competence in technical documentation (log-book) and presentation (report) of their practical experiences.

Course Contents

Practical experience in a workshop or industrial production facility, construction site or special centres in the university environment, considered suitable for relevant practical/industrial working experience but not necessarily limited to the student's major. The students are exposed to hands-on activities on workshop safety and ethics, maintenance of tools, equipment and machines, welding, fabrication and foundry equipment, production of simple devices;

electrical circuits, wiring and installation, etc. (8-10 weeks during the long vacation following 200 level).

300-Level Courses

ABE 311: Design of Machine and Structural Elements (2 Units C: LH 15; PH 45)
At the end of this course, students will be able to:

i. Explain the theories of failure of machine components;
ii. Analyse the loads on machine and structural elements;
iii. Apply shear force, bending moment, torsion, bending stresses in designing machine and structural elements;
iv. Design machine components such as belt drives, shafts, chain drives, gears;
v. Design beams and columns;
vi. Select fasteners such as nut and bolts, studs, bearings, etc. in designing machines; and
vii. Use computer software and empirical methods in designing machine and structural elements use

Content Course
Contents Design of machine elements: Theories of failure. Design of shafts, belt and pulley drives, gears, sprockets, bolts and nuts, keys and keyways; selection of bearings. Practical session: Use of computer software in machine design. Design of structural elements: Definitions. Hooke's law. Stress and strain due to loading. Torsion of circular members. Shear force. Bending moment and bending stresses in beams with symmetrical and combined loadings. Stress and strain transformation equations. Mohr cycle. Elastic buckling of columns. Design of beams using empirical methods and computer software. Design of columns using empirical methods and computer software. Group design assignment of machine or structural elements or complete system.

ABE 312: Crop Production (2 Units C: LH 30)
Learning Outcomes
At the end of the course, students will be able to:

i. Appreciate the various farming systems in agriculture with emphasis on Nigerian small farm holding including the impact of climate change;
ii. Describe the various farm machinery used in crop production; 3. Implement mechanical operations in crop production;

iii. Establish small, medium and large-scale mechanize farms;
iv. Undertake the application of fertilizer types for different crops;
v. Plan and implement irrigated agriculture; and 7. Undertake some post-harvest crop processing activities.

Course Contents

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. Conservation agriculture and sustainability in tropical agriculture.

ABE 313: Soil Science (2 Unit C: LH 30)

Learning Outcomes

After taking this course, this course, the students should be able to:

i. Apply the knowledge acquired in soil pedagogy, nutrient and nutrient exchange to managing soil fertility;
ii. Apply the different fertilizer types (organic and inorganic) appropriately to different soil types;
iii. Explain and describe the paedology, mineralogy and classification of soils;
iv. Undertake soil survey and mapping; and
v. Manage soils for agricultural production.

Course Contents

Origin and formation of soils. Physical properties of soils. Basic concept of soil paedology. Soil colloids; soil reaction; soil mineralogy. Soil organic matter. Soil survey and mapping. Soil classification. Soil fertility and fertilizers. Particle size distribution analysis/sieve analysis. Properties and management of Nigerian soils.

ABE 314: Biosystems Engineering (2 Units C: LH 30)

Learning Outcomes

Upon completing this course, students will be able to:

i. Appreciate biological engineering processes
ii. Analyse biosystems such as waste treatment systems;
iii. Design the various gadgets involved in unit operations in biological processes such as bio-reactors;

iv. Develop biosystems for energy production, municipal waste treatment; and apply computer to biological systems

Course Contents

Definitions. Modelling and design of fermentation systems. Microbial growth kinetics. Design of bio-reactors. Heat and mass transfer. Bioremediation of wastes. design of anaerobic and aerobic systems. Energy from biological systems. Monitoring and control of biological systems. Application of computer to biological processes.

GET 311: Engineering Statistics and Data Analytics (3 Units C: LH 45)

Learning Outcomes

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

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

Course Contents

Descriptive statistics, frequency distribution, populations and sample, central tendency, variance data sampling, mean, median, mode, mean deviation, percentiles, etc. Probability. Binomial, poison hypergeometric, normal distributions, etc. Statistical inference intervals, test hypothesis and significance. Regression and correlation. Introduction to big data analytics and cloud computing applications. Introduction to the R language; R as a calculator; Vectors, matrices, factors, data frames and other R collections. Iteration and looping control structures. Conditionals and other controls. Designing, using and extending functions. The Apply Family. Statistical modelling and inference in R.

GET 312: Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies

(3 Units C: LH 45)

Learning Outcomes

At the completion of the course, the students are expected to be able:

i. Explain the meaning, purpose, scope, stages, applications and effects of artificial intelligence;
ii. Explain the fundamental concepts of machine learning, deep learning and convergent technologies;
iii. Demonstrate the difference between supervised, semi-supervised and unsupervised learning;
iv. Demonstrate proficiency in machine learning workflow and how to implement the steps effectively;
v. Explain natural languages, knowledge representation, expert systems and pattern recognition;
vi. Describe distributed systems, data and information security and intelligent web technologies;
vii. Explain the concept of big data analytics, purpose of studying it, issues that can arise with a data set and the importance of properly preparing data prior to a machine learning exercise; and
viii. Explain the concepts, characteristics, models and benefits, key security and compliance challenges of cloud computing.

Course Contents

Concepts of human and artificial intelligence; artificial/computational intelligence paradigms; search, logic and learning algorithms. Machine learning and nature-inspired algorithms – examples, their variants and applications to

solving engineering problems; understanding natural languages; knowledge representation, knowledge elicitation, mathematical and logic foundations of AI; expert systems, automated reasoning and pattern recognition; distributed systems; data and information security; intelligent web technologies; convergent technologies – definition, significance and engineering applications. Neural networks and deep learning. Introduction to python AI libraries.

GET 313: Engineering Mathematics III (3 Units C: LH 45)

Learning Outcomes

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

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

Course Contents

Linear Algebra. Elements of Matrices, Determinants, Inverses of Matrices. Theory of Linear Equations. Eigen Values and Eigen Vectors. Analytical Geometry. Coordinate Transformation. Solid Geometry. Polar, cylindrical and spherical coordinates. Elements of functions of several variables. Surface Variables. Ordinary Integrals. Evaluation of Double Integrals, Triple Integrals, Line Integrals and Surface Integrals. Derivation and Integrals of Vectors. The gradient of scalar quantities. Flux of Vectors. The curl of a vector field, Gauss, Greens and Stoke's theorems and applications. Singular Valued Functions. Multivalued Functions. Analytical Functions. Cauchy Riemann's Equations. Singularities and Zeroes. Contour Integration including the use of Cauchy's Integral Theorems. Bilinear transformation.

GET 314: Engineering Laboratory II (1 Unit C: PH 45)

Learning Outcome

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

i. Understand the architecture and components of AI-enabled IoT systems.

ii. Interface and deploy sensors and devices for real-time data collection.

iii. Apply machine learning models for processing and analyzing IoT data.

iv. Design intelligent systems that adapt and respond to sensed data.

v. Implement cloud and edge-based analytics pipelines.

vi. Evaluate the ethical, security, and privacy aspects of AIoT solutions.

Introduction to IoT, AI, and Data Analytics: Concepts and Trends. IoT Architecture and Protocols (MQTT, HTTP, CoAP). Sensors, Actuators, and Embedded Platforms (Arduino, ESP32, Raspberry Pi). Data Acquisition, Signal Conditioning, and Streaming. Cloud and Edge Computing for IoT. Introduction to Machine Learning: Concepts and Tools (Python, Scikit-learn). Supervised Learning: Regression and Classification on IoT Data. Unsupervised Learning: Clustering, Anomaly Detection. Real-Time Analytics and Dashboarding (Node-RED, Grafana, Power BI). AI at the Edge: TinyML, TensorFlow Lite, Model Deployment on Microcontrollers. Case Studies: Smart Homes, Healthcare, Predictive Maintenance. IoT Security, Data Privacy, and Ethical Considerations. Project Planning and System Design. Final Project Development and Testing. Final Project Presentation and Demonstration.

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

Learning Outcomes

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

i. Analyse the concepts of peace, conflict and security;
ii. List major forms, types and root causes of conflict and violence;
iii. Differentiate between conflict and terrorism; 4. Enumerate security and peace building strategies; and
iv. Describe the roles of international organisations, media and traditional institutions in peace building.

Course Contents

The concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, economic, geo-political Conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory; root causes of conflict and violence in Africa: indigene and settlers phenomenon, boundaries/boarder disputes, political disputes, ethnic disputes and rivalries, economic inequalities, social disputes, nationalist movements and agitations; selected conflict case studies – Tiv-Junkun,

ZangoKartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security: Peace & Human Development. Approaches to Peace & Conflict Management (religious, government, community leaders.). Elements of peace studies and conflict resolution: Conflict dynamics assessment Scales: Constructive & Destructive. Justice and Legal framework: Concepts of Social Justice; The Nigeria Legal System. Insurgency and terrorism. Peace mediation and peace keeping. Peace and Security Council (international, national and local levels). Agents of conflict resolution – Conventions, Treaties Community Policing: Evolution and Imperatives. Alternative Dispute Resolution (ADR) (dialogue,. arbitration, negotiation, collaboration, etc). The roles of international organizations in conflict resolution ((a) The United Nations, UN and its conflict resolution organs. (b) The African Union & Peace Security Council (c) ECOWAS in peace keeping). The media and traditional institutions in peace building. Managing post-conflict situations/crises: Refugees. Internally Displaced Persons (IDPs); the role of NGOs in post-conflict situations/crises.

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

Learning Outcomes

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

i. Describe the key steps in venture creation;
ii. Spot opportunities in problems and in high potential sectors, regardless of geographical location; State how original products, ideas and concepts are developed;
iii. Develop a business concept for further incubation or pitching for funding;
iv. Identify key sources of entrepreneurial finance; 6. Implement the requirements for establishing and managing micro and small enterprises;
v. Conduct entrepreneurial marketing and e-commerce;
vi. Apply a wide variety of emerging technological solutions to entrepreneurship; and
vii. Appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market

gaps/market research, unutilised resources, social and climate conditions and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro-finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, First Mover Advantage, E-commerce business models and successful ecommerce companies). Small business management/family business: Leadership & Management, basic book keeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (The concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - artificial intelligence (AI), virtual/mixed reality (VR), Internet of things (IoTs), blockchain, cloud computing, renewable energy. Digital business and e-commerce strategies.

ABE 321: Animal Production (2 Units C: LH 30)

Learning Outcomes

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

i. Appreciate the basic science of animal production;
ii. Apply various engineering interventions in livestock housing, waste management, diary production; and
iii. Implement mechanization strategies in livestock production.

Course Content

Types of livestock (for eggs, milk, meat, wool, etc). distribution of livestock in Nigeria. Livestock housing. Livestock processing equipment.

ABE 322: Land Surveying and Geographical Information System (2 Units C: LH 30)

Learning Outcomes

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

i. Undertake cadastral, levelling and topographic surveys essential for anti-soil erosion intervention;
ii. Conduct levelling survey for road construction and farmstead planning; and

iii. Use GIS to do contour mapping for contour farming and reclamation of gullies.

Course Contents

Definitions. Measurement of distances. Use of minor instruments. Random errors. Chain surveying. Bearing of lines. Levelling. Topographic surveys. Traversing. Theodolite traversing. Plane table surveying. Triangulation. Land shaping and earthwork. Map reading. Photogrammetry. Aerial photography. Geographical Information System.

ABE 323: Rural Infrastructural Engineering (2 Units C: LH 30)

Learning Outcomes

After taking this course, students should be able to:

i. Identify the various engineering infrastructures for a rural community;
ii. Plan and design rural infrastructures such as roads, earth dams, electricity projects and irrigation projects; and
iii. Develop and implement a rural water scheme.

Course Contents

Concept of integrated rural development (planning and implementation). Overview of the problems of rural infrastructures. Review of agricultural construction survey. Rural road network. Rural road design, construction and maintenance; erosion of earth roads; minor road crossing. Small scale irrigation; rural electricity; rural water supplies; rural sanitation. Practical contents: A levelling survey exercise for road construction. Excursion: Visit to an earth dam site and an irrigation project.

ABE 324: Farm Management, Rural Sociology and Agricultural Extension (2 Units C: LH 30)

Learning Outcomes

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

i. Apply extension strategies to adopt technologies on Nigerian small rural farms from the understanding of rural sociology;
ii. Apply appropriate financial system to account for farm activities with a view to practicing profitable agriculture; and
iii. Take decisions appropriate to a farm establishment on staffing and machinery inputs.

Course Contents

Management decision making. Functions of management planning, organisation, staffing, directing and controlling. Financial management. Principles of extension: diffusion, adoption and rejection of innovations. Communication and leadership in agricultural extension.

GET 321-Engineering Economics 3 Units C: LH 45)

Learning Outcomes

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

i. Understand the importance of economics/fundamental economic concepts (supply/demand, costs/benefits and time value of money) to engineering decisions such as project selection, technology adoption and asset replacement.

ii. Evaluate projects using various economic methods and mathematical programming models like present value, net present value, internal rate of return, and discounted cash flow analysis.

iii. Understand the importance of budgeting, financial forecasting, depreciation accounting, cost control and other financial principles for engineering projects.

iv. Analyze the economic feasibility of different engineering designs and solutions, develop ability to assess the economic impact of engineering decisions on various stakeholders and make economic decisions under uncertainty and in complex decision-making environments.

Course Content:

The nature and scope of economics. Basic concepts of engineering economy-Relationship between Science, Engineering, Technology and Economics. Theories of Maximization-Profit Maximization, Growth Maximization, Sales Revenue Maximization, Utility Maximization and Wealth Maximization. Theory of Demand-Demand schedule, Nature and characteristics of demand, Law of demand, Limitations to the law of demand, Elasticity of Demand: Price, Income and Cross elasticity, Demand Forecasting definition, factors determining demand forecasting, methods of demand forecasting. Cost Concepts-Types of costs: Fixed cost, Variable cost, Average cost, Marginal cost, Real cost, Opportunity cost, Accounting and Economic cost, Cost - Volume profit analysis, Break - Even analysis, Operating leverage. Interest formulae, discounted cash

flow, present worth, equivalent annual growth and rate of return comparisons. Replacement analysis. Benefit-cost analysis. Minimum acceptable rate of return. Acccounting Concepts-Double Entry system, Journal, Ledger, Trail balance, Final Accounts Book Keeping system, Depreciation - Definition, functions, methods of depreciation; Straight line, Declining balance; Sum of years digits method. Judging attractiveness of proposed investment.

GET 322: Technical Writing and Communication (3 Units C: LH 45)

Learning Outcomes

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

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

Course Contents

A brief review of common pitfalls in writing. Principles of clear writing (punctuations and capitalization). Figures of speech. Units of grammar. Tenses and verb agreement. Active and passive sentences Lexis, structure Fog and Index concept. Skills for communication and communication algorithm. Types and goals of communication; Interpersonal communication; features and the Finger Model or A,B,C,D,E of good interpersonal communication (accuracy of technical terms, brevity of expression, clarity of purpose, directness of focus and effectiveness of the report). Language and organisation of reports. Technical report writing skills(steps, problems in writing, distinguishing technical and other reports, significance, format and styles of writing technical reports). Different formats for communication; styles of correspondences – business report and proposal, business letter, memorandum, e-mails, etc. Proposals for projects and research; format, major steps and tips of grant oriented proposals. Research reports (competency, major steps, components and formats of research reports and publishable communication). Sources and handling of data, tables, figures, equations and references in a report.

Presentation skills; overview, tips, organisation, use of visual aids and practising of presentation. Intellectual property rights in research reports. Case studies of major engineering designs, proposals and industrial failures with professional presentation of reports.

GET 323: Engineering Mathematics IV (3 Units C: LH 45)

Learning Outcomes

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

i. Solve second order differential equations;
ii. Solve partial differential equations;
iii. Solve linear integral equations;
iv. Relate integral transforms to solution of differential and integral equations;
v. Explain and apply interpolation formulas; and
vi. Apply Runge-Kutta and other similar methods in solving ODE and PDEs.

Course Contents

Series solution of second order linear differential equations with variable coefficients. Bessel and Legendre equations. Equations with variable coefficients. Sturn-Louville boundary value problems. Solutions of equations in two and three dimensions by separation of variables. Eigen value problems. Use of operations in the solution of partial differential equations and Linear integral equations. Integral transforms and their inverse including Fourier, Laplace, Mellin and Handel Transforms. Convolution integrals and Hilbert Transforms. Calculus of finite differences. Interpolation formulae. Finite difference equations. Runge-Kutta and other methods in the solutions of ODE and PDEs. Numerical integration and differentiation.

GET 324: Renewable Energy Systems & Technology (3 Units C: LH 30; PH 45)

Learning Outcomes

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

i. Identify the types, uses and advantages of renewable energy in relation to climate change;
ii. Design for use the various renewable energy systems;
iii. Recognise and analyse the current energy systems in Nigeria, their impacts on development and the global energy demand and supply scenarios;

iv. Appreciate the environmental impact of energy exploitation and utilisation, and pursue the sustainable development of renewable energy for various applications; and
v. Recognise the exploitation, excavation, production, and processing of fossil fuels such as coal, petroleum and natural gas, and discuss the sources, technology and contribution to future energy demands of renewable energy.

Course Contents

Current and potential future energy systems in Nigeria and globally - resources, extraction, concepts in energy conversion systems; parallels and differences in various conversion systems and end-use technologies, with emphasis on meeting 21st-century national, regional and global energy needs in a sustainable manner. Various energy technologies in each fuel cycle stage for fossil (oil, gas, synthetic), nuclear (fission and fusion) and renewable (solar, biomass, wind, hydro, and geothermal). Energy types, storage, transmission and conservation. Analysis of energy mixes within an engineering, economic and social context. Sustainable energy; emphasise sustainability in general and in the overall concept of sustainable development and the link this has with sustainable energy as the fundamental benefit of renewable energy. Practical Contents Simple measurement of solar radiation, bomb calorimeter determination of calorific value of fuels and biomass; measurement of the velocity of wind, waves and the energy that abound in them; laboratory production of biogas and determination of energy available in it; simple conversion of solar energy to electricity; trans-esterification of edible oil into biodiesel; simulation of geothermal energy; GeigerMuller or Scintillation Counters' determination of uranium or thorium energy; simple solid or salt storage of energy; hybrid application of renewable energy.

GET 399: Students Industrial Work Experience II (4 Units C: 12 Weeks)

Learning Outcomes

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

i. Demonstrate proficiency in at least any three softwares in their chosen career choices; 2. Demonstrate proficiency in some animation videos (some of which are free on YouTube) in their chosen careers;
ii. Carry out outdoor hands-on construction activities to sharpen their skills in their chosen careers;
iii. Demonstrate proficiency in generating data from laboratory analysis and develop empirical models;

iv. Demonstrate proficiency in how to write engineering reports from lab work;
v. Fill logbooks of all experience gained in their chosen careers; and
vi. Write a general report at the end of the training. The experience is to be graded and the students must pass all the modules of the attachment and shall form part of CGPA.

Course Contents

On-the-job experience in industry chosen for practical working experience but not necessarily limited to the student's major (Students are to proceed on three months of work experience i.e. 12 weeks during the long vacation following 300 level). Students are engaged in the more advanced workshops, indoor software design training similar to what they will use in the industry and outdoor construction activities to sharpen their skills. The use of relevant animation videos that mimic industrial scenarios is encouraged. Students are to write a report at the end of the training. As much as possible, students should be assisted and encouraged to secure 3 months placement in the industry. Examples of outline of activities and experiences to which students are expected to be exposed to earn prescribed credits include:

Section A: Welding and fabrication processes, automobile repairs, · lathe machine operations: machining and turning of simple machine elements, such as screw threads, bolts, gears, etc. Simple milling machine operations, machine tool maintenance and trouble-shooting, and wooden furniture making processes.

Section B: Mechanical design with computer graphics and CAD modelling and drafting. Introduction to Solidworks: software capabilities, design methodologies and applications. Basics part modelling: sketching with SolidWorks, building 3D components, using extruded Bose base · Basic assembly modelling, and solidWorks drawing drafting. Top-down assembly technique exploded view, exploded line sketch. Introduction to PDMS 3D design software; autoCAD mechanical, SPSS. A comprehensive case study design project. The student should be introduced to the concept of product/component design and innovation and then be given a comprehensive design project. Examples of projects should include the following:

a. Design of machine components;
b. Product design and innovation;
c. Part modelling and drafting in Solid Works; and
d. Technical report writing.

400 LEVEL COURSES

ABE 411: Instrumentation and Measurement in Agricultural and Biosystems Engineering
Learning Outcomes (2 Units C: LH 30; PH 45)

This course will help students to:

i. Identify the appropriate instruments for measuring parameters relevant to agricultural activities;
ii. Manage the acquisition, transmission, recording, analysing and computing of data; and
iii. Apply these instruments, particularly for research in agricultural and biosystems engineering.

Course Contents
Motion, force, torque and shaft power, pressure and sound flux; humidity measurement; application of primary sensing element; data manipulation, computing and compensating devices; data transmission and recording.

ABE 412: Engineering Properties and Handling of Bio-Materials (2 Units C: LH 30)
Course Learning Outcome
At the end of this course, the students should be able to:

i. Mention and explain the Physical, mechanical, rheological and thermal properties of agricultural materials.
ii. Explain the Newtonian and non-Newtonian fluids.
iii. Describe the Characterization of bio-fluids and fluid food viscometer.
iv. Explain the Texture and quality of food materials. Mechanical damage. Handling methods.
v. Design and construct appropriate material handling equipment for tropical products.
vi. 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.

Cleaning, sorting, separation and grading techniques, principles and machines. Particle size analysis. Heat treatment. Dehydration and drying psychometric.

ABE 413: Agro-Resources Structures & Environmental Control (2 Units C: LH 30)

Course Learning Outcome

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

i. State the Environmental and structural requirements of crops and livestock.
ii. Describe the Planning of farm and livestock houses; storage and stores.
iii. Design structural members.
iv. Explain the Water supply and sewage disposal methods and give Specifications and selection of farm building materials.
v. 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. Design of livestock houses: poultry, cow, diary, sheep and goat, pig houses. Water supply and sewage disposal. Specifications and selection of farm building materials. Environmental control for plants and livestock. Use of psychometric charts. Farmstead planning and layout

ABE 414: Irrigation & Drainage Principles (2 Units C: LH 30)

Course Learning Outcome

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

i. Highlight the Water requirement in an irrigation system.
ii. Explain the Methods of irrigation. Frequency and amount of irrigation, irrigation water scheduling.
iii. Evaluate irrigation systems and practices.
iv. Design furrow basin and sprinkler irrigation system.
v. Explain the Effects of poor drainage on plants and soils.
vi. Outline the Drainage requirements of crops,
vii. Explain the surface drainage and Sub-surface drainage

Course Contents

Irrigation: water requirements in an irrigation system. Methods of irrigation. Frequency and amount of irrigation. Irrigation water scheduling. Evaluating irrigation systems and practices. Design of furrow, basin, drip and sprinkler

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

Drainage: Effect of poor drainage on plants and soils. Drainage requirements of crops, surface drainage. Sub-surface drainage. Design of drainage systems. Envelope materials and their design. Loads on conduits. Drainage pumping. Construction and installation of drains. Maintenance of drains.

ABE 415: Engineering Hydraulics (2 Units C: LH 30: PH:30)

Course Learning Outcome

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

i. Identify Fluid properties, fluid statics.
ii. Explain Fluid motion, continuity, Bernoulli, energy momentum equations.
iii. State the Reynolds number
iv. Explain Laminar and turbulent flow pipe flow.
v. Describe Open channel flow. Weirs, flumes, pumps, turbines, outlets, gates, valves
vi. Explain Pipe flow: pipes in parallel and in series. Branched pipes. Simple pipe network.
vii. Explain Water hammer. Hydraulic pump. Back water curves. Hardly cross-method of water distribution.
viii. Describe Open channel flow. Channel transition and control. Dimensional analysis and similitude reservoir hydraulic and planning. High pressure outlet, gates, valves.
ix. Explain Fluid properties. Fluid statics. Fluid motion. Continuity, Bernoulli, energy, momentum equations.
x. Explain Reynolds number. Laminar and turbulent flows. Pipe flow open channel, flow weirs flumes, pumps, turbine, High pressure outlets, gates valve.

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. 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 416: Field Operation and Management of Farm Power & Machinery (2 Units C: LH 15: PH 45)

Course Learning Outcome

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

i. Identify Farm power sources:
ii. Explain Farm tractors' selection, use, and maintenance.
iii. Explain other power sources: selection, use and maintenance.
iv. Explain the Hitches and hitching system.
v. Highlight the Design consideration of a single cycle two wheel drive, four wheel drive and crawler tractors. Tractor mechanics.
vi. Explain Power measurement. Fluid control. Tractor testing and test codes.

Course Contents

Farm power sources: engine power, wind energy, solar energy, biofuels, manual power, animal draft power. Engine power: the spark ignition and compression ignition engines. Components of the internal combustion engine. The Otto cycle and diesel cycle PV diagrams. Engine operating characteristics – indicated and brake powers, mechanical, thermal and volumetric efficiencies. Measurement of engine power by the Morse dynamometer test. Fuels. The 4-wheel and 2-wheel drive tractors. Farm machinery: tillage, weeders, planters, sprayers, harvesters. Post-harvest machines: grinders, decorticators, shellers, threshers, fruit extractors. Tillage: Primary, secondary and conservation tillage. Types of tillage implements: ploughs, harrows, land planes Force measurement on tillage tools. Conservation agriculture and sustainability in tropical agriculture. Livestock production equipment. Adjustment, maintenance and repair of farm tractors and equipment. Field performance of crop production equipment.

ABE 417 Soil and Water Conservation Engineering (2 Units C: LH 30)

Course Learning Outcome

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

i. Identify and explain the types of erosion, soil erosion by water,
ii. State the Universal soil loss equation

iii. Explain the Control of soil erosion by water. Wind erosion and its control, Desertification and control measures.

iv. Explain Earth dams and farm ponds

Contents

Types of erosion: gully; rill; sheet. Soil erosion by water. Universal soil loss equation. Control of soil erosion by water: agronomic and engineering methods. Agronomic methods: contour farming; wickerwork fences; proper land clearing and development. Engineering methods: stone-pitch works; gabion baskets; hydraulic drop structures – stilling basin; spill way structures. Wind erosion and its control. Desertification and control measures. Design of earth dams and farm ponds.

ABE 418 : Alternative Energy Application in Agriculture (2 Units, C: 30)

Learning Outcome

i. Understand the principles and applications of alternative energy sources in agriculture

ii. Design and evaluate solar energy systems for agricultural applications

iii. Analyze the potential and limitations of bioenergy and other renewable energy sources in agriculture

iv. Develop energy-efficient practices and conservation measures for agricultural buildings and equipment

v. Conduct feasibility studies and develop projects for alternative energy systems in agriculture

Course Content

Fundamentals of Solar Radiation, (Solar irradiance and radiation patterns, Solar energy availability and potential), Solar Heating and Cooling (Solar thermal systems for heating and cooling; Applications in agricultural buildings and greenhouses),Heat Transfer (Principles of heat transfer :conduction, convection, radiation; Heat transfer in solar collectors and storage systems), Solar Energy Conversion Efficiency (Efficiency of solar collectors and systems, Factors affecting efficiency ; temperature, irradiance, etc.), Principles of Solar Collectors (Types of solar collectors ; flat plate, evacuated tube, etc.; Design and operation of solar collectors), Solar Heat Storage and Storage Systems (Sensible

heat storage ; water, rocks, etc.; Latent heat storage : phase change materials; Applications in tropical crops), Solar Pumps (Solar-powered water pumping systems; Applications in irrigation and water supply), Solar Cookers and Ovens (Design and operation of solar cookers and ovens; Applications in rural areas), Bioenergy (Biomass resources : crop residues, animal waste, etc.), Biomass conversion technologies (anaerobic digestion, gasification, etc.), Biogas production and utilization, Wind Energy (Wind energy potential and assessment; Applications in agriculture (irrigation, power generation)), Case Studies and Project Development (- Real-world examples of alternative energy projects in agriculture Project development and feasibility studies)

ABE 419: Soil Mechanics II for Agricultural and Biosystem Engineers II (2 Units C: LH 30)

Course Learning Outcome

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

i. Analyze soil behaviour and properties under different conditions, including compaction, shear stress, and water interaction.
ii. Understand the principles of machine-soil interaction and predict soil failure under various loading conditions.
iii. Apply soil mechanics principles to design and analyze soil related structures, such as slopes and retaining walls.
iv. Conduct laboratory and field tests to determine soil properties and behaviour.
v. Evaluate soil stability and erosion potential, and develop strategies for mitigation and control.
vi. Describe the earth.
vii. Explain the Geological Processes.
viii. Identify the Engineering properties of rocks
ix. Explain stratigraph. Geotectonics. Geomorphology, Mineralogy and Petrology.
x. Describe the Geology of Nigeria.

Course Content

Soil stability analysis (slope stability, retaining walls), Soil erosion and sediment transport, Soil-water interaction (infiltration, drainage), Laboratory testing of soils (Atterberg limits, compaction test), Field testing of soils (Standard Penetration Test, Cone Penetration Test). The earth. Geological Processes.

Engineering properties of rocks stratigraph. Geotectonics. Geomorphology, Mineralogy and Petrology. Geology of Nigeria.

ABE 421: Agricultural and Biosytem Engineering Laboratory Practical's
(1 units C: PH 45)
Learning Outcome
At the end of this course, the students should be able to:

i. Students will understand the importance of moisture content in agricultural products and learn a practical method for measuring it.
ii. Students will gain a basic understanding of farm tractors and tillage implements, their functions, and importance in agricultural production.
iii. Students will understand the principles of soil erosion, the impact of rainfall intensity on soil loss, and the importance of soil conservation practices.
iv. Explain how to take measurement of solar radiation, wind speed and internal combustion engine power output.
v. Explain how to determine mechanical, volumetric and thermal efficiencies of the internal combustion engine using the engine test bed.
vi. Describe the process of measuring the brake power and indicated power of an engine.
vii. Explain how to take measurement of stream flow velocity using flumes, weirs and flow meters and gully cross-sections using the planimeter.
viii. Explain how to determine the Finess modulus, particle size diameter of grains.
ix. Describe the process of measuring the erodibility and erosivity of soils.
x. Describe the process of Draft measurement using the dynamometer.
xi. Explain how to take measurement of water infiltration into the soil using the infiltrometer.
xii. Explain how to take measurement of water permeability through the soil using the permeameter.
xiii. Explain Sieve analysis of grains and the slump test for concrete consistency.
xiv. Describe the cubic test for concrete.
xv. Explain how to determine evapotranspiration of plants using the lysimeter.

Course Contents

A complete hands-on introductory practical course on various aspects of agricultural and biosystems engineering. Student will be able to determine the moisture content of various agricultural products (e.g., soil, grains, fruits, or vegetables) using the oven drying method by deploying the use of Oven, weighing balance and desiccators. Determine the particle size diameter of grain. Carry out the sieve analysis of grains. Introduce students to agricultural processing machines, equipments and operational procedures. Introduce students to farm tractors and tillage implements, their components, and basic operations. Demonstrate the operation of the tractor and tillage implements. Have students observe and participate in the operation of the tractor and implements. Introduce students to the concept of soil erosion and measure the effects of rainfall intensity on soil loss. Measure and collect runoff water and sediment. Calculate soil loss and compare results between treatments. Practical sessions on measurement of solar radiation, wind speed and internal combustion engine power output. Determination of mechanical, volumetric and thermal efficiencies of the internal combustion engine using the engine test bed. Measurement of brake power and indicated power of an engine. Measurement of stream flow velocity using flumes, weirs and flow meters and gully cross-sections using the planimeter. Determination of Finess modulus, particle size diameter of grains. Measurement of erodibility and erosivity of soils. Draft measurement using the dynamometer. Measurement of water infiltration into the soil using the infiltrometer. Measurement of water permeability through the soil using the permeameter. Sieve analysis of grains. The slump test for concrete consistency. The cubic test for concrete. Determination of evapotranspiration of plants using the lysimeter

GET 421 Engineering Project I (2 Units C: PH 90)

Learning Outcomes

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

i. Complete the design phase of a complex engineering problem sourced from industry or community during the SIWES III programme.
ii. Demonstrate the connection between engineering product-making and the theoretical courses they have learned following the applicable industry best practices.

Course Contents

In the second semester of the 400-level students, preferably in groups, work from the university on the identified industry or organization to tackle industry

complex engineering problems. Theoretical issues may be provided by the department faculty or industry experts. During the vacation, students will now work full time with the organisation/industry on the project as part of the SIWES III. The students can also go beyond the department and engage in multidisciplinary undertakings. Literature survey, review of existing systems etc. must be achieved to a satisfactory extent.

GET 422 Engineering Valuation and Costing (2 Units C: LH 30)

Learning Outcomes

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

i. Identify at least three (3) objectives of engineering valuation work, valuer's primary duty and responsibility and valuation terminologies.
ii. Describe at least four (4) Valuer's obligation to his or her client, to other valuers, and to the society.
iii. Demonstrate with example the engineering valuation methods, valuation standards, and practices.
iv. Prepare engineering valuation and appraisal reports and review
v. Discuss expert witnessing and ethics in valuation.
vi. Determine price, cost, value, depreciation and obsolescence in real property, personal property, personal property, machinery and equipment, oil, gas, mines, and quarries valuation

Course Content

Objectives of valuation work/ valuer's primary duty and responsibility. Valuer's obligation to his or her client, to other valuers, and to the society. Valuation methods and practices. Valuation reports. Expert witnessing. Ethics in valuation. Valuation standards. Price, cost and value. Depreciation and obsolescence. Valuation terminology. Real asset valuation; personal asset valuation. Machinery and equipment valuation. Oil and gas facilities valuation. Mines and quarries valuation. Appraisal reporting and review.

GET 499: Students Industrial Work Experience III (4 Units C: 12 weeks)

Learning Outcomes

Students on Industrial Work Experience Scheme (SIWES) are expected to:

i. Be exposed and prepared for the Industrial work situation they are likely to meet after graduation, by developing their occupational competencies;

ii. Bridge the existing gap between theory and practice of programmes through exposure to real-life situations, including machines and equipment handling, professional work methods and ethics, human relations, key performance assessment methods, and ways of safeguarding the work environment – human and materials;
iii. Experience/simulate the transition phase of students from school to the world of work and the environment seamlessly,and expose them to contacts for eventual job placements after graduation;
iv. Be motivated to identify the industrial and practice engineering challenges of their place of engagement and the larger society and creatively device impactful solutions to them; and
v. Exploit the opportunity to improve and utilise their acquired critical thinking and innate creativity skills, during the program and SIWES Seminar presentation respectively.

Course Contents

On-the-job experience in industry chosen for practical working experience but not necessarily limited to the student's major (12 weeks from the end of the first semester at 400-Level to the beginning of the first semester of the following session. Thus, the second semester at 400-Level is spent in industry). Each student is expected to work in a programme related industry, research institute or regulatory agencies etc, for a period of 6 months under the guidance of an appropriate personnel in the establishment but supervised by an academic staff of the Department. On completion of the training, the student submits the completed Log book on the experience at the establishment., Also, there will be a comprehensive report covering the whole of the student's industrial training experiences (GET 299, GET 399 and GET 499), on which a seminar will be presented to the Department for overall assessment.

500-LEVEL COURSES

ABE 511: Environmental and Social Impact Analysis (2 Units C: LH 30)

Learning Outcomes

After taking this course, students should be able to:

i. Determine the impact and consequences of agricultural projects on the environment and
ii. Measure them;
iii. Explain the environmental policies and regulations of their locality;

iv. Analysis projects and take decisions as to whether it will have a positive or negative
v. Impact on the environment; and
vi. Design the remediation of projects with negative impact.

Course Contents

Concept of environmental and social consequences/dimensions of development

projects. Methods of impact analysis. Physical, sociological, legal, economic, environmental and public health implications of human activities. Effects of changed environments on man. Examples of impact assessment with particular reference to developing countries. Role of environmental engineering in preventing or reducing environmental stress. Environmental and social management plans (ESMP); Planning and policy, administration and organisation of natural resources development and public health. Land use planning and landscape design. Monitoring and evaluation of projects for ESIA compliance. Practical content: Students are expected to undertake an environmental and social impact analysis of an ongoing project on campus.

ABE 512: Livestock Production Engineering (2 Units C: LH 30)

Learning Outcomes

After taking this course, the students will be able to:

i. Explain the various rearing systems including the transhumance system of rearing;
ii. Describe the production systems in the livestock enterprise;
iii. Design livestock housing types;
iv. Identify the various engineering interventions in the livestock enterprise, which include
v. the machinery for feeding, sanitation of the livestock housing, milking, irrigation of the
vi. pastures in a ranch;
vii. Plan, design and implement a ranch;
viii. Select appropriate machinery for various operations; and
ix. Manage livestock wastes for energy production.

Course Contents

Production systems: rearing, fattening and milk production systems. Rearing systems: objectives; nomadic, transhumant, sedentary, scavenging and

industrial (ranching) – organisation, personnel and infrastructures. Design, construction and equipment for housing for pigs, sheep, goats, domestic fowls, cattle and dairy cattle. Fattening production systems: Grass and intensive fattening. Milk production systems: factors limiting tropical milk production; milking bail; milking parlour: selection, design and types. Environmental requirements for animals. Environmental impact on animal growth and reproduction on their general physiology. Assessment of thermal comfort. Parameters affecting thermal comfort of animals. ASHRAE comfort charts. Ventilation systems: natural and automated. Aerodynamics of animal buildings. Building design methodology. Integrating animals with their environment through building designs. Disease control: Causes, factors favouring transmission. Design of buildings to control diseases. Animal waste management: Characteristics of animal wastes. Objectives of waste treatment; aerobic and anaerobic treatment of waste; manure disposal equipment. Excursion: Visit to a functional biogas plant.

ABE 513: Drone and Robot Technology in Agriculture (2 Units C: LH 15; PH 30)

Learning Outcomes

This course will enable students know control, tools, programming languages, sensors and

actuators involved in automation; design and use of robots and drones in agriculture.

Students are expected to be able to:

i. Identify and explain the forms of automation and its control systems, automation tools
ii. and various computer programming languages;
iii. Explain the types and application of sensors;
iv. Design and select sensors and actuators;
v. Describe and explain the types, classification and architecture of drones;
vi. Explain the types, characteristics and advantages of agricultural robots;
vii. Apply drones and robots in agriculture; and evaluate the performance, accuracy and repeatability of robots.

Course Contents

Automation: Introduction to automation. Control systems: open-loop and closed-loop, feedback control, logic control, on-off control and linear control systems. Control actions: discrete control (on/off); PID controller; sequential control and logical sequence or system state control; computer control.

Automation tools: artificial neural network (ANN); distributed control system (DCS); human machine interface (HMI); robotic process automation (RPA); supervisory control and data acquisition (SCADA); programmable logic controller (PLC); instrumentation; motion control; robotics. Programming languages: introduction to programming language; Matlab programming, R programming, C, C# and C++ programming, Java and Java Script programming and Python programming. Sensors and actuators: introduction to sensors, types and applications. Design and selection of sensors. Introduction to actuators, types and applications. Design and selection of actuators. Drones or Unmanned Aerial Vehicles (UAVs): Introduction, types and classification of drones. Architecture (components) of a drone: flight controller; electronic speed controller (ESC); battery; radio transmitter/receiver; antenna; propellers; electric motor; camera and its accessories.; ground station; intelligent sensors; intelligent battery; GNSS and RTK module. Advantages and disadvantages of drones. Design and selection of drones. Working principles of a drone. Performance considerations criteria of a drone. Application of drones in agriculture. Robots: Introduction, types and characteristics of agricultural robots (Agribot). Primary areas of robotics: operator interface; mobility or locomotion; manipulators and effectors; programming; sensing and perception. Advantages and disadvantages of robots. Robot design process. Design of components of agricultural robots: end effectors; grippers; manipulators. Operating principles of an agricultural robot. Performance evaluation of robots: productive time, overhead time and working efficiency index. Accuracy and repeatability of a robot. Application of robot to agriculture.

ABE 514: Mechanization and Integrated Agricultural Production System (2 Units C: LH 30)

Course Learning Outcome

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

i. Explain farm mechanization
ii. State Nature and objectives of agricultural mechanization.
iii. Mention Factors affecting the agricultural mechanization in the tropics.
iv. Describe Agricultural mechanization as a strategy for rural development.
v. Explain Integrated Commercial Farming
vi. Design and development of Special Integrated Agro-Industrial Production and Processing Zones (SIAPZ);

vii. describe the rationale, features and design considerations in Integrated Commercial Farming
viii. Explain farm input, agro-services, production and aggregation centres, agro-industrial hubs and ancillary facilities.
ix. Describe the management of production and value-addition hubs, the concept of out-and in-growers for integrating smallholder farmers and women.
x. Explain Management of agri-produce for export using case studies from Africa and Asia.

Course Content

Mechanization: Nature 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 infrastructural development. Linkages with rural industrialization. Case studies of selected farms.

Integrated Commercial Farming: Design and development of Special Integrated Agro-Industrial Production and Processing Zones (SIAPZ); rationale, features and design considerations, farm input, agro-services, production and aggregation centres, agro-industrial hubs and ancillary facilities. Management of production and value-addition hubs, the concept of out-and in-growers for integrating smallholder farmers and women. Management of agri-produce for export.Case studies from Africa and Asia.

Farm Machine Usage: Integrated approach to machine usage and agricultural production sequence. Equipment selection, scheduling of operation, seasonality factor. Machinery factor. Machinery ownership and financing. Gross margin analysis. Optimization of machinery – input combinations. Management of farm enterprise. Case studies.

ABE 515: Crop/ Food Processing and Storage of Agricultural Materials (2 Units C: LH 30)

Course Learning Outcome

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

i. Explain Cleaning, sorting, grading and separation.
ii. Explain Principles, Techniques and machines communition.
iii. Describe the Particle size analysis.
iv. Explain Heat treatment, dehydration and drying.
v. Describe Psychometry,

vi. Mention and explain the storage types and environment.
vii. Explain deterioration of produce in storage structures.
viii. Explain environmental control in storage.
ix. Explain heat and mass transfer.
x. Explain insulation. Heat exchange-design and application.
xi. Explain heat and cold preservation of foods.
xii. Explain blanching, food quality control.
xiii. Design food equipment and food packaging systems

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. Definition. Heat and mass transfer. Enthalpy and mass balances; sterilization; freezing; fluid flow; pipes; steam, refrigeration; pump and valves. Insulation. Heat exchangers- design and applications. Heat and cold preservation of foods. Food packaging. Food quality control. Principles and design of food equipment, Blanching.

ABE 516: Hydrology (2 Units C: LH 30)

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, Evapo-transpiration, infiltration and subsurface flow.
4. Determine Rainfall excess and overland flow. Run-off relations for agricultural watersheds. Stream flow 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. Stream flow routing. Groundwater flow (hydraulics). Watershed management. Stream gauging, Hydrographs.

ABE 517: Agro-Resources Transportation and Ergonomics (2 Units *E: LH 30)

Course Learning Outcome

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

i. Explain Farm Roads. Farm transportation system. Need for efficient farm transportation system.
ii. Describe Development and construction of farm transportation equipment.
iii. Explain Farm transport- systems, standards and specification,
iv. Explain the Ergonomics; factors that affect the operators, Man machine relationship. Anthropometry,
v. 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 518: Agricultural Land Drainage (2 Units *E: LH 30)

Course Learning Outcome

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

i. Explain Surface drainage. Sub-surface drainage.
ii. Design drainage systems.
iii. Explain Envelop material and their design.
iv. Explain Loads on conduits.
v. 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.

ABE 519: Land Clearing & Development (2 Units E: LH 30)

Course Learning Outcome

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

i. Explain Land resources and Land Use Act in relation to Nigerian agriculture.
ii. State the objectives Land resources and Land Use Act in relation to Nigerian agriculture,

iii. Explain methods and equipment for land clearing and development.
iv. Describe machinery selection, mechanics of operation
v. Describe land reclamation.
vi. Explain Earthmoving machinery and earthmoving mechanics.

Course Content

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

GET 511: Engineering Project Management (3 Units C: LH 45)

Learning Outcomes

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

i. Explain the basics of project management as it relates to the Engineering discipline;
ii. Demonstrate knowledge and understanding of engineering, management and financial
iii. Principles and apply these to their own work, as a member and/or leader in a team, to
iv. Manage projects and in multi-disciplinary environments;
v. Conduct, manage and execute projects in multi-disciplinary areas;
vi. Possess the skills needed for project management; and work within the budget when executing a project for proper management.

Course Contents

Project management fundamentals – definitions, project environment, nature and characteristics, development practice, management by objectives, and the centrality of engineering to projects, infrastructures, national and global development. The scope of project management – organisational, financial, planning and control, personnel management, labour and public relations, wages and salary administration and resource management. Identification of project stakeholders; beneficiaries and impacted persons – functions, roles, responsibilities. Project community relations, communication and change management. Project planning, control and timeliness; decision making, forecasting, scheduling, work breakdown structure (WBS), deliverables and timelines, logical frameworks (log frames), risk analysis, role of subject matter experts (SMEs), role conflicts; Gantt Chart, CPM and PERT. Optimisation, linear

programming as an aid to decision making, transport and materials handling. Monitoring and Evaluation – key performance indices (KPIs); methods of economic and technical evaluation. Industrial psychology, ergonomics/human factors and environmental impact considerations in engineering project design and management. Project business case - financial, technical and sustainability considerations. Case studies, site visits and invited industry professional seminars. General principles of management and appraisal techniques. Breakthrough and control management theory; production and maintenance management. Training and manpower development. The manager and policy formulation, objective setting, planning, organising and controlling, motivation and appraisal of results.

GET 512: Engineering Law (2 Units C: LH 30)

Learning Outcomes

Students will be able to:

i. Describe and explain the basic concept, sources and aspects of law;
ii. Describe and explain the major differences between the various categories of law, courts and legal jurisdictions;
iii. Describe and explain legal principles and their application in professional engineering
iv. Design and management services and their professional liability implications; and
v. Develop reasoned analysis of real-life or hypothetical engineering scenarios using the legal principles undertake critical analysis of reliable information to develop, and practically present technical reports for use in varying judicial/quasi-judicial settings including as an expert witness.

Course Contents

Common Law: its history, definition, nature and division. Legislation, codification interpretation. Equity: definition and its main spheres. Law of contracts for Engineers: Forms of contract and criteria for selecting contractors; offer, acceptance, communication termination of contract. Terms of Contracts; suppliers' duties – Damages and other Remedies. Termination/cancellation of contract Liquidation and Penalties; exemption clauses, safety and risk. Health and Safety. Duties of employers towards their employees. Duties imposed on employees. Fire precautions act. Design for safety. General principles of criminal law. Law of Engineering and Technology 105 New torts: definition, classification and liabilities. Patents: requirements, application, and infringement. Registered

designs: application, requirements, types and infringement. Company law. Labour law and Industrial Law. Business registration.

ABE 521: Aquaculture and Agroponic Engineering (2 Units C: LH 30)

Learning Outcomes

Students will after taking this course have the capacity to:

i. Appreciate fish farming, the machinery involved and integration of fish farming aspect
ii. To the other crop and livestock enterprises on a farm;
iii. Design mechanized fish ponds, conserve water, manage the wastes from the ponds;
iv. Design and construct efficient fish drying kilns; and
v. Explain the benefits, practice and management of agroponic agriculture.

Course Contents

Aquaculture: Types of fish ponds. Design and construction of fish ponds. Integrated fish farming. Water quality for fish farming. Water conservation. Machinery for fish farms. Pollution control. Ecological re-use and disposal of water. Product harvesting, sorting and processing. Design of fish kilns. Agroponics: Agroponic farming systems. Prospects of agroponic agriculture in Nigeria. Soil and water management in agroponic systems. Economics of agroponic systems. Modern aquaponics and hydroponics systems design and use. Practical content: Each student is expected to plant a yam seedling in a bag of sand and monitor its growth until harvest during the semester. Excursion: Visit to a commercial fish farm site or the university fish farm.

ABE 522: Design of Agro-Resources Machinery (2 Units C: LH 30)

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

i. Explain Machine design processes and procedures.
ii. Explain Materials of construction, selection, strength properties, stress analysis and costing.
iii. Explain Design of machine elements.
iv. Carry out Machine fabrication. Typical design of low cost agricultural machinery.
v. 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 523: Farm and Rural Electrification (2 Units C: LH 30)

Course Learning Outcome

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

i. Explain Electrical codes, tariffs, and regulation. Generation and transmission of electricity.
ii. Explain Farmstead distribution systems. Testing procedure. Power factor correction.
iii. Explain Selection and use of electric motors. Transformers.
iv. Describe Energy conversion.
v. Explain the Application of electricity to handling, processing and storage of agricultural products.
vi. 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 524: Greenhouse Technology

(2 Units C: LH 30)

Learning Outcomes

Students are expected to be able to:

i. Define greenhouse and associated technologies;
ii. Describe the types of greenhouses;
iii. Analyse the thermal profile of greenhouses;
iv. Determine the influence of the climate on the control and implementation of the
v. environment in greenhouses;
vi. Undertake climate control and cultivate plants in greenhouses; and

Design and construct low cost and effective greenhouses for crop cultivation

Course Contents

Definition of greenhouse. Meaning of greenhouse technology and controlled environment agriculture (CEA). History and present scenario of greenhouse cultivation. Importance of greenhouse crop cultivation. Types of greenhouses. Types of covering materials and thermal screens for greenhouses. Planning of greenhouses. Importance of different climatic and non-climatic factors in selecting proper greenhouse technology. Measuring systems required for greenhouse. Design, construction and cost estimate of a greenhouse. The bamboo greenhouse technology. Control mechanisms for different climatic conditions: light, temperature, humidity, precipitation and carbon dioxide. Special methods of crop husbandry in greenhouse cultivation. Excursion: Visit to a commercial farm with greenhouse facility.

ABE 525: Tractor & Automotive Management (1 Units C: LH 15: PH 45)

Learning Outcome

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

i. Identify the components of an internal combustion engine
ii. Differentiate between spark ignition and compression ignition.
iii. Describe the various internal combustion engine systems:
iv. Explain lubrication and electrical ignition,
v. Describe cooling, transmission, fuel, steering and brake.
vi. Schedule maintenance practices.
vii. Explain Hands-on service and maintenance of all the components of a tractor and automobiles.

Content

Identification of the components of an internal combustion engine (spark ignition and compression ignition). The various internal combustion engine systems: lubrication, electrical ignition, cooling, transmission, fuel, steering and brake. Schedule maintenance practices. Hands-on service and maintenance of all the components of a tractor and automobiles.

ABE 526: Packaging & Containerization Engineering (1 Units C: LH 15)

Course Learning Outcome

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

i. Explain the Purpose of packaging food and biomaterials.

ii. Identify Packing types.
iii. Explain Marketing requirements for packaging. Storage environmental requirements.
iv. Identify the types of packing configuration. Palletization. Canning technology.
v. Explain Aseptic processing and packaging. Modified atmosphere packaging and applications.
vi. 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.

ABE 527: Foundation Engineering (2 Units *E: LH 30)

Course Learning Outcome

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

i. Explain Stress in soils. Consolidation, compaction.
ii. Explain CBR and soil improvement. Stability of slopes.
iii. Carry out Earth pressure analysis. Bearing capacity and settlement analysis of shallow and deep foundations.
iv. Design footings, foundations, retaining walls.
v. 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.

ABE 528: Rural Water Supply & Sanitation (2 Units *E: LH 30)

Course Learning Outcome

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

i. Explain Water requirements. Water quality standards.
ii. Identify and explain Water borne disease.
iii. Explain Biochemical oxygen demand. Potable water impurities. Sources

and treatment methods of water for rural homes. Water lifting devices.

iv. Explain Transportation and distribution systems. Pipes sizes.
v. 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. Collection, conveyance, treatment and disposal of sewage from rural homes. Septic tanks, digestion ponds and family privies.

ABE 529: Agro-Resources Power and Machinery Systems Management (2 Units *E: LH 30)

Course Learning Outcome

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

i. Identify the Types of farm machinery.
ii. Conduct Force analysis and state the design consideration of various farm machinery.
iii. Explain Hitching methods.
iv. Highlight the Power requirements for operating farm equipment and machines.
v. Carry out Field evaluation and highlight Criteria for replacement.
vi. Explain integrated approach to machinery usage and agricultural production sequence.
vii. Explain Equipment selection, scheduling of operation, seasonal factor.
viii. Explain Machinery management. Machinery ownership and financing.
ix. Carry out Gross margin analysis. Optimization – input combination management of farm enterprise.

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. 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 599: Final Year Project (4 Units C: LH 15: PH 180)

Learning Outcomes

The project will enable students to:

i. Synthesis all that was learnt in the programme to develop a technology or obtain data that can be deployed to solving a major agricultural and biosystems engineering problem.

Course Content

Each student must undertake a project under the supervision of a lecturer, submit a comprehensive project report and present a seminar at the end of the year. A project status report is to be presented at the end of the first semester. Each student must present a project proposal seminar before the beginning of the project. This course lasts for one academic session.

GET 521 – Engineering Management (3 Units C: LH 45)

Learning Outcomes:

Upon completing this course, students will be able to:

i. Develop leadership and team working skills for evaluating and optimizing processes, improving efficiency and managing supply chains within engineering organizations.

ii. Foster innovation, manage new technologies and integrate sustainability principles in an engineering environment.

iii. Gain proficiency in identifying, assessing and mitigating risks associated with engineering projects and manage change effectively within engineering organizations

Course Contents

Essence of management task. Patterns of leadership. Creating a viable organization. Productivity and motivation, organizing task. The span of control and the delegation of authority. Organizational theory and concepts. Industrial safety. Industrial relations. Technology innovation and sustainability: Change, Risk, Logistic and Supply Chain management. Application of industrial engineering tools to solve health care delivery problems focused on cost reduction and quality improvement by facility and process redesign and systems integration. Operational specialties integration in a project consulting firm. Group technology tasks involve designing, planning and implementing an engineering project to stimulate students' multidisciplinary teams' working ability or application of industrial engineering tools in evaluating and solving any practical organizational problem.

SECTION 6
EMPLOYMENT OPPORTUNITIES

2.1 Career Opportunities

Agricultural & Biosystem 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 & Biosystem Engineering Department is for those who:

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

SECTION 7

Table 7.1: List of Full-Time Departmental Academic Staff

S/N	Name of Staff	COREN Number	Rank	Details Of Qualification
1.	Engr. Prof. M.C. Ndukwu	R.22419	Professor	Ph.D, M.Eng, B.Eng
2.	Engr. Prof, I.E Ahaneku	R.5594	Professor,	Ph.D,M.Eng,B.Eng
3	Engr. Prof. K.J. Simonyan	R.9759	Professor,	Ph.D, M.Eng, B.Eng
4.	Engr. Prof. A.B. Eke	R.15,179	Professor	Ph.D, M.Eng, B.Eng
5.	Engr. Prof.U.N. Onwuka	R.22545	Professor,	Ph.D, M.Eng,B.Eng
6.	Engr. Prof. J.C. Adama	R. 11369	Professor,	Ph.D, M.Eng, B.Eng
7.	Engr. Prof. A N. Aviara	R.22280	Professor	Ph.D, M.Eng, B.Eng
8.	Engr. Prof. U.J. Eto Amaihe	R.9212	Professor	Ph.D, M.Eng, B.Eng
9.	Engr. Prof. M.C. Ndukwu	R.22419	Professor	Ph.D, M.Eng, B.Eng
10.	Engr. Dr. O. Oduma	R. 46,993	Associate Professor	Ph.D, M.Eng, B.Eng
11.	Engr. Dr. J.C. Ehiem	R. 48162	Senior Lecturer	Ph.D, M.Eng, PGD, HND
12.	Engr. Dr. A.O. Igbozulike	R.45277	Senior Lecturer.	Ph.D, M.Eng, B.Eng
13.	Engr. Dr. Mrs. C.C. Emeka-Chris	R.16986	Senior Lecturer	Ph.D, M.Eng, B.Eng

14.	Engr. C.U. Orji	R.10478	Lecturer I	M.Eng, B.Eng
15.	Engr. Dr. E.C. Ugwu	R.52205	Senior Lecturer	Ph.D, M.Eng, B.Eng
16.	Engr. Dr. P. Ehiomogue	R.45184	Senior Lecturer	Ph.D, M.Eng, B.Eng
17.	Engr. Femi Pearse	R.52045	Lecturer I	M.Eng, B.Eng
18.	Engr. O.S. Babalola	R.52993	Lecturer I	M.Eng, B.Eng
19.	Engr. Dr. F.N, Orji	R.54605	Lecturer I	Ph.D, M.Eng, B.Eng
20.	Engr. Dr. Ikechukwu-Ede Evlyn Chidinma	R.53627	Lecturer I	Ph.D, M.Eng, B.Eng
21.	Engr. Ikechukwu Okosa	R. 54379	Lecturer I	M.Eng, B.Eng
22.	Engr. Dr. Onu O. Onu		Lecturer I	Ph.D, M.Eng, B.Eng
23	Engr. Dr. C.A. Onyenwoke	R.41151	Lecturer I	Ph.D, M.Eng, B.Eng

Table 7.2: List of Shared/Visiting Staff from other Departments/Organizations

S/N	Name of Staff	COREN Number	Rank/Post	Qualification
1.	Engr. Dr. O.A. Dr. Ubachukwu	R.14,647	Senior Lecturer	Ph.D,M.Eng B.Eng,
2.	Engr. V.N. Irokwe	R.40585	Lecturer I	M.Eng, B.Eng
3.	Engr. Dr C. Iroegbu	R. 42177	Lecturer I	Ph.D,M.Eng, B.Eng
4.	Engr. Dr. G.C. Diyoke	R. 29600	Senior Lecturer	Ph.D, M.Eng, B.Eng
5.	Engr. Dr. Ozioko		Senior	Ph.D, M.Eng,

			Lecturer	B.Eng
6.	Engr. Dr. C.K. Okoro	R. 35160	Senior Lecturer,	Ph.D, M.Eng,.B.Eng
7.	Engr. Dr. C.C. Awah	R.41864	Senior Lecturer	Ph.D, M.Eng, B.Eng
8.	Engr. Dr. I.K. Onwuka	R.28174	Senior Lecturer	Ph.D, M.Eng, B.Eng
9.	Engr. Dr. U.N. Okonkwo		Senior Lecturer	Ph.D, M.Eng, B.Eng
10.	Engr. Dr. F.C. Onyeka	R.54605	Lecturer I	Ph.D, M.Eng, B.Eng
11.	Engr. Dr. K.C. Onyelowe		Senior Lecturer I	Ph.D, M.Eng, B.Eng
12	Engr. Dr.Nelson Ubani		Lecturer I	Ph.D, M. Eng,B.Eng
13	Engr. Dr.Aguele Felix		Lecturer I	PhD, M. Eng, B.Eng

Table 7.3: List of Full-Time Laboratory Technologists

S/N	Name of Staff	**COREN Number**	**Rank**	**Qualification**
1.	Engr. F O Nkwazema		Chief Technologist	M.Eng, PGD, HND
2.	Engr. Okafor Yadi O.	R. 2869ET	Principal Technologist	PGD, HND
3.	Engr. N.N.Amanze	R.2793ET	Chief Technologist	PGD, HND,ND
4.	Mr. I. I Okwo		Principal Technical Officer II	HND

5.	Mr. Dirioha Cyprain		Engineer I	B.Eng
6.	Mr. Nwosu K. C.		Technologist	HND, OND
7.	Mr. Tasie Oscer U.		Technologist	M.SC, HND, OND
8.	Engr. Paul, Tosin	R.54716	Engineer I	M.Eng,B.Eng
9.	Mr. Joseph Edet		Technologist I	M.Eng, B.Eng
10.	Mr. Unachukwu J. O.		Engineer II	B.Eng

LABORATORIES/WORKSHOPS IN AGRICULTURAL AND BIORESOURCES ENGINEERING

Laboratory/Workshop

1. Farm Power and Machinery Laboratory
2. Soil and Water Laboratory
3. Processing Laboratory
4. Crop processing hub
5. Thermodynamics Laboratory
6. Basic Electricity Laboratory
7. Geotechnical/ soil Mechanics Laboratory
8. Concrete/ strength of materials Laboratory
9. Fluid Mechanics Laboratory
10. General Engineering workshop
11. AI/Unipod workshop