Department of Agricultural and Bio-Resources Engineering

Faculty of Engineering/Institute for Agricultural Research

AHMADU BELLO UNIVERSITY, ZARIA

UNDERGRADUATE STUDENT HANDBOOK

2025

FOREWORD

This handbook is prepared to provide basic information to students that have enrolled into the Undergraduate Academic Programme of the Department of Agricultural and Bio-Resources Engineering, Faculty of Engineering, Ahmadu Bello University, Zaria. It will also be of great benefit to prospective students and the general public who may seek information about the Department. The handbook gives highlight about the Department; programmes; admission, registration and graduation requirements; course classification, contents and synopsis; continuous assessment and examination regulations; etc. The document is to be used together with other publications of the University that spelled-out rules and regulations that will guide students throughout their stay in the University.

On behalf of the entire staff of Department of Agricultural and Bio-Resources Engineering, I would like to welcome you to the Department. It is important to note that now you are entering into University environment where you will have great freedom, you should not be unmindful of the responsibilities that comes with it. There will be no one to check on your daily activities once you leave the department, as such you are accountable to yourself. I urge you to be diligent in your study and desist from bad behaviours such as cultism, examinations mal-practices, drug abuse, indecent dressing and all other social vices. Wishing you successful stay in the Department and the University in general in order to be good ambassadors of the department.

Engr. Prof. Aminu Saleh
Head of Department

1.0 INTRODUCTION

Department of Agricultural Engineering (now called Department of Agricultural and Bio-Resources Engineering) started as a Programme at the Institute for Agricultural Research (IAR). Samaru. The Institute was established in 1922 as Research Division of the then Northern Nigeria Ministry of Agriculture. With the establishment of Ahmadu Bello University in 1962, the Institute was transferred to the new University and has since operated under its administrative umbrella. The department was initially a section in the Department of Agricultural Economics in 1965 and later in 1972 a section in the Department of Agronomy and finally became a full-fledged department in 1975 under Faculty of Agriculture. Its initial affiliation to the Faculty of Agriculture was shifted to the Faculty of Engineering in 1976 to ensure greater interaction with other engineering disciplines and acceptability to the Council for the Regulation of Engineering in Nigeria (COREN). The department thus is one of the academic departments in IAR as well as in the Faculty of Engineering. In 2010, the department reviewed its curriculum and changed its nomenclature to Department of Agricultural and Bio-Resources Engineering in order to reflect the reality of today's societal needs and to also attract young prospective students into the department. The implementation of this revised curriculum started in 2017/2018 academic session. For these many years of its existence, the department has been actively participating in Degree Awarding Programmes and Research Activities. The research activities of the department are conducted through the Agricultural Mechanization and Irrigation Research Programmes of the Institute for Agricultural Research, depending on the nature of the project. The department has developed many technologies that are presently being used by the farmers in and outside Nigeria.

The department awards a B.Eng. (Agric. and Bio-Res.) at the under-graduate level. The core academic contents of the degree programme include Farm Power and Machinery, Soil and Water Engineering, Farm Structures and Environmental Control, Crop Processing and Storage, Farm Electrification, and Bio-Resources Engineering. Due to the present level of development in the country, specialization at the first degree in these core areas of the profession is not encouraged. The general degree programme has improved the employment opportunities after graduation. The department also offers postgraduate programmes leading to the award of M.Sc. and Ph.D. in Farm Power and Machinery, and Soil and Water Engineering. Areas where our graduates could be absorbed include the Ministries (of Agriculture, Water Resources, Science and Technology, Environment, etc), Research Institutes, Universities, Polytechnics, the River Basins, Agricultural and Rural Development Authorities, Mechanized Farms, Agricultural Machinery Industries, Consultancy Firms, Banks, etc.

2.0 VISION, MISSION AND PHILOSOPHY OF AGRICULTURAL AND BIO-RESOURCES ENGINEERING DEPARTMENT

Vision

To be recognized as a centre of excellence and innovation in agricultural and bio-resources engineering education and research.

Mission

To train high quality and innovative Agricultural and Bio-Resources Engineers; to research and develop functional and cost-effective technologies for agricultural value chain while protecting the environment for sustainable agricultural development and food security.

Philosophy

With the high demand for more raw materials both for industry and human consumption, the demand for agricultural engineers will surely increase. The philosophy of the training programme in Agricultural and Bio-Resources Engineering is aimed at integrating teaching, research and extension in agriculture into a unified curriculum to solve real and practical problems of the environment it serves and ensuring food security for the nation and beyond.

3.0 PROGRAMME EDUCATIONAL OBJECTIVES

In line with the philosophy of the Department and the objectives of the University as articulated in Article 4 of its 1962 and 1975 Laws, and in consistency with the aforementioned mission and vision of both Ahmadu Bello University and Agricultural and Bio-Resources Engineering Department, the Programme Educational Objectives (**PEOs**) are to:

i. train students through a well-established training curriculum and facilities that reflect professionalism in agricultural and bio-resources engineering practice **(PEO1)**;
ii. provide sufficient knowledge to apply engineering principles to the practice of agriculture, feedstock production, food processing and conservation of land and water resources **(PEO2)**;
iii. provide sufficient knowledge in agricultural power and machinery usage and management **(PEO3)**;
iv. provide sufficient knowledge in bio-product process engineering, biotechnology, biofuels, waste treatment and by-product utilization **(PEO4)**;
v. train competent professionals with sufficiently broad-based knowledge to tackle day-to-day Agricultural and Bio-Resources Engineering problems and continuously relate their acquired skills to the needs of the society **(PEO5)**;
vi. provide sufficient knowledge in tools and machinery development that assist in reducing drudgery in production and encourage import substitution **(PEO6)**;
vii. contribute to value addition in agricultural products and at affordable prices to end-users **(PEO7)**.

4.0 PROGRAMME OUTCOMES

It is expected that students who complete the Bachelor of Engineering in Agricultural and Bio-Resources Engineering programme at Ahmadu Bello University would acquire knowledge, skills and attitude that will equip them with the ability to solve real-world problems. These

expectations/attributes, referred to as **Programme Outcomes** (**POs**). Thus, a graduate of Agricultural and Bio-Resources Engineering programme is expected to have the attributes/abilities described in Table 3.1.

Table 3.1: Expected attributes/**POs** that graduates from our programme will possess.

Programme Outcome ID	**Programme Outcome**
PO1: Engineering Knowledge	Ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of developmental and complex engineering problems
PO2: Problem Analysis	Ability to identify, formulate, research literature and analyze developmental and complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences
PO3: Design and Development of Solutions	Ability to proffer solutions for developmental or complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations
PO4: Investigation	Ability to conduct investigation into developmental or complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions
PO5: Modern Tool Usage	Ability to create, select and apply appropriate techniques, resources and modern engineering and ICT tools, including prediction, modelling and optimization to developmental and complex engineering activities, with an understanding of the limitations
PO6: The Engineer and Society	Ability to apply reasoning informed by contextual knowledge including Humanities and Social Sciences to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice
PO7: Environment and Sustainability	Ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development
PO8: Ethics	Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice, including adherence to the COREN Engineers' Codes of Conduct
PO9: Individual and Team Work	Ability to function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings
PO10: Communication	Ability to communicate effectively on developmental or 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, and give and receive clear instructions
PO11: Project Management	Ability to demonstrate knowledge and understanding of engineering, management and financial principles and apply these to one's own work,

	as a member and leader in a team, to manage projects and in multi-disciplinary environments
PO12: Lifelong Learning	Ability to recognize the need for, and have the preparations and ability to engage in independent and lifelong learning in the broadest context of technological and social changes

5.0 ADMISSION REQUIREMENTS

The admission requirements into the programme are:

i. Unified Tertiary Matriculation Examination (UTME) and five credits in the Senior Secondary School Final Examination or GCE 'O' level which must include Mathematics, Physics, Chemistry and English plus any other one science subject preferably Biology, Agricultural Science or Geography. The UTME Subjects include Mathematics, Physics, Chemistry and English.

ii. Direct Entry using National Diploma (ND) and Higher National Diploma (HND) in Engineering with Upper Credit and Lower Credit, respectively plus O' Level requirements, or Interim Joint Matriculation Board (IJMB) examination result (which must include Mathematics and Physics) with at least 10 points score plus O' Level requirements.

iii. Special Admission (Direct Entry into 300 Level) with HND (Upper Credit) in Agricultural Engineering plus O' Level requirements.

6.0 DURATION OF PROGRAMME

The programme is designed for a total duration of five (5) years. However, an additional two and half (2½) years is provided to accommodate any unprecedented circumstances such as academic, ill-health or financial challenges. This implies that, the maximum tenancy period is seven and half (7½) years while five (5) years is the minimum. In the course of the programme, the students shall undertake Students Works Experience Programme (SWEP) in their second semester of second year (200 Level) and it lasts for eight weeks. At second semester of the fourth year (400 Level), the students also undertake Students Industrial Works Experience Scheme (SIWES) for a total period of six (6) months. The aim is to expose the students to practical application of the programme.

7.0 MINIMUM GRADUATING REQUIREMENTS

For a student of Department of Agricultural and Bio-Resource Engineering to graduate, he or she must have earned a minimum total of 180 credit units comprising all prescribed core, cognate and restricted elective courses. The breakdown per level and semester is as presented in Table 1.

Table 1: Minimum credit units required for graduation

Level	Credit Unit (CU)		
	First Semester	**Second Semester**	**Total**
100	19	19	38
200	20	20	40
300	22	18	40
400	18	6	24
500	21	17	38
Grand Total			**180**

Depending on the entry level, the summary of the minimum credit units required for graduation is shown in Table 2.

Table 2: Summary of minimum credit units required for graduation based on entry level

Entry Level	Credit Unit (CU)
100 L (UTME)	180
200 L (Direct Entry)	146
300 L (Special Admission)	108

8.0 IMPORTANT TERMINOLOGIES

Credit Unit: A credit unit is the minimum unit of workload of a course. It is a measure of work load that described the student-teacher's contact hour(s) per week per semester. It depends on the total number of contact hours spent on the course. For example, 1 credit unit is equivalent to 15 hours of lecture, or 15 hours of tutorial, or 45 hours of laboratory work, or 1 month of industrial attachment.

Core Courses: Core courses are central to the degree programme in view. They are offered by the department offering the degree and must be passed before graduation.

Cognate Courses: Cognate courses are prescribed courses from related fields which are very necessary for understanding and appreciation of the student's field of study. These courses must also be passed before graduation.

Restricted Electives: These are courses from which a student is made to select one or more to satisfy given credit unit(s). The required credit units for restricted electives for any given semester must be satisfied before graduation. However, if a student failed a chosen elective course(s), he or she may decide to repeat the course or chose another one to satisfy the requirement.

Unrestricted Electives: They are courses which are opted for by the student in accordance with his or her own interest. They are normally offered from any Faculty within the University but should not be more than 5% (about 8 credit units) of all the credit units of the required course units for the degree in view.

Grade Point (GP): This is the actual percentage raw score for a given course converted into a letter grade and a grade point.

Grade Point Average (GPA): This is the average of weighted grade point earned in the courses taken during a semester. The GPA can be obtained as shown in section 11.0.

Cumulative Grade Point (CGPA): This is the up-to-date average of the grade points earned by a student in a programme of study. It indicates the student's overall performance at any level in the programme of study. The CGPA can be obtained as shown in section 11.0.

Probation: It is a status granted to student whose academic performance, as measured by the CGPA, falls below 1.00 (for classified degree) at the end of two consecutive semesters.

Withdrawal: A student who fails to attain the status of "good academic standing", by remaining on probation for three consecutive semesters (that is, having CGPA below 1.00 for four consecutive semesters) shall be withdrawn from the programme of study.

9.0 REGISTRATION

It is the primary responsibility of every student to ensure that he or she pay the appropriate registration fees and register at the beginning of each session according to the registration process in operation during that session.

No student would receive credit for a course in which he or she is not properly registered. This is applicable even if the student attended the classes and wrote the examination prescribed in that course. Also, if a student registered for a course and later dropped the course without notification and proper amendment to his or her registration records, the student would be deemed to have been absent in that examination and would be regarded as having failed the course, and this will affect the student's Grade Point Average (GPA).

Students must register all the courses to be offered within two weeks given for registration. No course registration would be allowed after the official closing of registration. However, the University allows for a period during which course(s) can be added or dropped for the initial registration record.

Note:

i. The registration process includes getting copies of registration forms/documents signed and submitted to Departmental Academic Adviser or Registration Officer and other relevant places at the Faculty and Academic Office.

ii. The minimum and maximum credit loads permissible per semester are 12 and 24 credit units, respectively. A 100 level student must earn not less than 24 credit units at the end of

an academic session to proceed to 200 Level. Similarly, 200, 300 and 400 Levels students must earn at least 48, 72, 96 credits to proceed to 300, 400 and 500 levels, respectively.

10.0 CLASS ATTENDANCE

Class attendance is very important for good understanding of the courses contents. A student who registered for any course must have a minimum of 75% attendance before he or she can be eligible to sit for the semester examination.

11.0 EXAMINATION REGULATIONS

The regulations guiding the management of examination and the categories of punishment for examination malpractices have been spelled out by the University Senate in a handbook titled Examination Management/Regulations. You are advised to have a copy of the handbook and study it carefully so that you do not fall victim of examination malpractice.

12.0 PROCEDURES FOR CALCULATION OF GPA AND CGPA

Student's academic performance may be evaluated on the basis of Continuous Assessment (assignment, practical, test, etc) and Examination. Continuous Assessment is normally graded over 40% while examination is 60% of the total mark. The mark ranges, letter grade and grade points are as presented in Table 3.

Table 3: Mark ranges, letter grade and grade points

Score range	Letter grade	Grade point
70 – 100	A	5
60 – 69	B	4
50 – 59	C	3
45 – 49	D	2
40 – 44	E	1
0 – 39	F	0

The grade points can be used to calculate the GPA and CGPA. Examples using first and second semesters results for 300 level are as presented in Tables 4 and 5, respectively.

Table 4: 300 level first semester results.

Course	Score	Letter grade	Grade Point (GP)	Credit Unit (CU)	Credit Point, CP = (GP)x(CU)
MEEN301	65	B	4	2	8
MEEN305	56	C	3	1	3
MEEN307	70	A	5	2	10
MATH341	63	B	4	3	12
STAT343	54	C	3	2	6
QTYS309	60	B	4	2	8
ABEN303	71	A	5	2	10
ABEN305	67	B	4	2	8
AGRN399	75	A	5	2	10
GENS301	70	A	5	2	10
				TRCU = ∑(CU) = 20	**TCP = ∑(GP)x(CU) = 85**

Where,

TRCU = total registered credit unit

TCP = total credit point

For first semester, Grade Point Average (GPA) $= \frac{TGP}{TRCU} = \frac{85}{20} = 4.25$

Table 5: 300 level second semester results.

Course	Score	Letter grade	Grade Point (GP)	Credit Unit (CU)	Credit Point, CP = (GP)x(CU)
ABEN302	80	A	**5**	2	10
ABEN312	71	A	5	2	10
ABEN314	75	A	5	2	10
ABEN342	65	B	4	2	8
MEEN302	74	A	5	2	10
MMEN316	60	B	4	2	8
MATH342	62	B	4	2	8
ANSC304	80	A	5	2	10
				TRCU = ∑(CU) = 16	**TCP = ∑(GP)x(CU) = 74**

For second semester, **Grade Point Average (GPA)** $= \frac{TGP}{TRCU} = \frac{74}{16} = 4.63$

The student's overall performance is measured in terms of **Cumulative Grade Point Average** (***CGPA***), thus,

$$\boldsymbol{CGPA} = \frac{Previous\ TGP + Present\ TGP}{Previous\ TRCU + Present\ TRCU} = \frac{85+74}{20+16} = 4.42$$

13.0 DEGREE CLASSIFICATION

The class of degree awarded shall be determined by a student's CGPA as presented in Table 6.

Table 6: Degree classification on the basis of CGPA

CGPA	***Class of Degree***
4.50 - 5.00	First Class
3.50 - 4.49	Second Class (Upper Division)
2.40 - 3.49	Second Class (Lower Division)
1.50 - 2.39	Third Class
1.00 - 1.49	Pass
< 1.00	Fail

14.0 COURSE CONTENTS

14.1 Course Structure

100 LEVEL

FIRST SEMESTER

Course Code	Course Title	Contact Hours L/T	P	Credit Unit	Status	Pre-requisite	Remarks
MATH101	Set theory and Number	30	-	2	Cognate	-	
MATH103	Trigonometry Coordinate Geometry	30	-	2	Cognate	-	
MATH105	Differential and Integral Calculus	30	-	2	Cognate	-	
PHYS111	Mechanics	30	-	2	Cognate	-	
PHYS131	Heat and Properties of Matter	30	-	2	Cognate	-	
PHYS161	General Physics Practical 1	-	45	1	Cognate	-	
CHEM101	Introductory General Chemistry	30	-	2	Cognate	-	
CHEM161	Introductory Practical Chemistry	-	45	1	Cognate	-	
GENS101	Nationalism	15		1	Cognate	-	
GENS103	English and Communication Skills	30		2	Cognate	-	
	Electives	30		2	Elective		Restricted

Total			19			

List of Restricted Electives:

COSC101	Basic Computer Programming	2
CHEM121	Introduction to Inorganic Chemistry	2

SECOND SEMESTER

Course Code	Course Title	Contact Hours L/T	P	Credit Unit	Status	Pre-requisite	Remarks
MATH102	Algebra	30	-	2	Cognate	-	
MATH104	Conic Section/Application to Calculus	30	-	2	Cognate	-	
MATH106	Vectors and Dynamics	30	-	2	Cognate	-	
STAT102	Introduction to Statistics	30	-	2	Cognate	-	
PHYS122	Electricity, Magnetism and Modern Physics	30	-	2	Cognate	-	
PHYS124	Geometry and Wave Optics	30	-	1	Cognate	-	
PHYS162	General Physics Practical II	-	45	1	Cognate	-	
CHEM112	Introductory Physical Chemistry	30	-	2	Cognate	-	
CHEM132	Introductory Organic Chemistry	30	-	2	Cognate	-	
CHEM162	Introductory Practical Chemistry II	-	45	1	Cognate	-	
ENGG102	Introduction to Engineering Profession	15		1	Cognate	-	
Electives	30	15		1	Electives		Restricted
Total				19			

List of Restricted Electives:

GENS102	Environmental Health	1
GEN104	History and Philosophy of Science	1

200 LEVEL

FIRST SEMESTER

Course Code	Course Title	Contact Hours L /T	P	Credit Unit	Status	Pre-requisite	Remarks
CVEN201 (ENGG203)	Introduction to Structural Analysis	15	45	2	Cognate	-	
MEEN201 (ENGG201)	Engineering Graphics		90	2	Cognate	-	
WREN201 (ENGG211)	Fluid Mechanics	15	45	2	Cognate	-	
MMEN201 (ENGG209)	Material Science	15	45	2	Cognate	-	
EEEN201 (ENGG205)	Electric Circuit and Field Theory	15	45	2	Cognate	PHYS124	
EEEN203 (ENGG207)	Electrical Machines, Power and Installation	15	45	2	Cognate	-	
MATH241	Calculus I	45	-	3	Cognate	MATH105	
MATH243	Method of Linear Algebra I	30	-	2	Cognate	MATH102	
GENS201	Moral Philosophy	15	-	1	Cognate	-	
Electives		30	-	2	Elective		Restricted
Total				20			

List of Restricted Electives:

CHEM121	Introduction to Inorganic Chemistry	2
COSC101	Basic Computer Programming	2
AERS201	Principles of Economics	3

SECOND SEMESTER

Course Code	Course Title	Contact Hours L/T	P	Credit Unit	Status	Pre-requisite	Remarks
ABEN202	Introduction to Agricultural	15	-	1	Core	-	
MEEN202 (ENGG202)	Engineering Drawing	15	90	3	Cognate	-	
MEEN204 (ENGG204)	Strength of Materials I	15	45	2	Cognate	-	
MEEN206 (ENGG206)	Fundamental of Dynamics	15	45	2	Cognate	-	
MEEN208 (ENGG208)	Basic Thermodynamics	15	45	2	Cognate	-	
EEEN202 (ENGG212)	Electronics, Measurements and Transducers	15	45	2	Cognate	PHYS122	
CHEN202 (ENGG210)	Introduction to Management	15	-	1	Cognate	-	
MATH242	Calculus II	30	-	2	Cognate	MATH105	
MATH244	Methods of Linear Algebra II	45	-	3	Cognate	MATH102	
GENS202	Entrepreneurship and Innovation	20	-	2	Cognate		
SWEP298 (ENGG298)	Student Work Experience Programme (SWEP)		-	-			
Total				20			

For Direct Entry Candidates, the following are additional courses to register for:

i. GENS 101,

ii. GENS 103, and

iii. ENGG 102.

300 LEVEL

FIRST SEMESTER

Course Code	Course Title	Contact Hours L/T	P	Credit Unit	Status	Pre-requisite	Remarks
MEEN301	Machine Design I	15	45	2	Cognate	MEEN202	
MEEN305	Strength of Material II	15	-	1	Cognate	MEEN204	
MEEN307	Dynamics of Machine I	15	45	2	Cognate	MEEN206	
MATH341	Differential Equation and Transforms	45	-	3	Cognate	MATH241	
STAT343	Statistics	30	-	2	Cognate	STAT102	
QTYS309	Development Economics	30	-	2	Cognate		
ABEN303	Agricultural Climatology for Engineers	15	45	2	Core		
ABEN305	Soil Mechanics for Agric. & Bio-Resources Engineers	15	45	2	Core		
AGRN399	Elements of Crop Production	30		2	Cognate		
GENS301	Business Creation & Growth	30		2	Cognate		
Electives		30	-	2	Elective		Restricted
Total				22			

List of Restricted Electives:

MEEN309	Applied Thermodynamics	2
CVEN301	Theory of Structures	2

SECOND SEMESTER

Course Code	Course Title	Contact Hours L/T	P	Credit Unit	Status	Pre-requisite	Remarks
ABEN302	Agricultural Surveying	15	45	2	Core		
ABEN312	Agricultural Power & Machinery	15	45	2	Core		
ABEN314	Agricultural Workshop Practice	15	45	2	Core		
ABEN342	Engineering properties of Biological Materials	15	45	2	Core		
MEEN302	Machine Design II	15	45	2	Cognate	MEEN202	
MMEN316	Metallurgy for Engineers I	15	45	2	Cognate		
MATH342	Function of Several Variables	30	-	2	Cognate	MATH241	
ANSC304	Animal Production for Agric. Engineers	30	-	2	Cognate		
Electives		30		2	Elective		Restricted
Total				18			

List of Restricted Electives:

CVEN302	Theory of Structures II	2
MEEN306	Dynamics of Machines II	2
COSC344	Basic Computer Knowledge and FORTRAN	3

For Special Admission (Direct Entry into 300 level) Candidates, the following are additional courses to register for:

i. GENS 101,
ii. GENS 103,
iii. ENGG 102, and
iv. GENS 202.

400 LEVEL

FIRST SEMESTER

Course Code	Course Title	Contact Hours L/T	P	Credit Unit	Status	Pre-requisite	Remarks
ABEN401	Irrigation I	15	45	2	Core		
ABEN403	Agricultural Hydrology	15	45	2	Core	ABEN303	
ABEN405	Hydraulic for Agricultural and Bio-Resources Engineers	15	45	2	Core		
ABEN443	Biomass conversion and Bio-energy Feedstock Production	15	45	2	Core	ABEN342	
ABEN413	Land Clearing and Development	15	45	2	Core		
ABEN431	Instrumentation	15	45	2	Core		
ABEN497	Technical Report Writing	15	-	1	Core		
QTYS421	Law for Engineers	15	-	1	Cognate		
STAT443	Design of Experiment and Quality Control	30	-	2	Cognate	STAT343	
Electives		30		2	Elective		Restricted
Total				18			

List of Restricted Electives:

CVEN407	Design of Hydraulic Structures	2
COSC441	Numerical Analysis	2
CHEN409	Financial Management	2
MATH441	Complex Analysis	3

SECOND SEMESTER

Course Code	Course Title	Contact Hours	Credit Unit	Status	Pre-requisite	Remarks
	S I W E S		6		72 CU	

500 LEVEL

FIRST SEMESTER

Course Code	Course Title	Contact Hours L/T	P	Credit Unit	Status	Pre-requisite	Remarks
AERS503	Farm Management and Agricultural Extension	15	-	1	Cognate		
ABEN501	Irrigation system Design, management and Evaluation	15	45	2	Core	ABEN401	
ABEN503	Soil and Water Conservation	30	45	3	Core	ABEN202	
ABEN513	Agricultural Machinery Management	15	45	2		AGEN314	
ABEN515	Agricultural Power	15	45	2	Core	AGEN312	
ABEN521	Processing and Storage of Agricultural Products I	30	45	3	Core	ABEN447	
ABEN523	Farm Structures	15	45	2	Core	ABEN202	
ABEN531	Entrepreneurship for Agricultural Engineers	15		1	Core	-	
ABEN597	Final Year Project	-	-	3	Core		
Electives		30		2	Elective		Restricted
Total				21			

List of Restricted Electives:

CHEN409	Financial Management	2
COSC441	Numerical Analysis	2
MTEN523	Welding and Brazing	2

SECOND SEMESTER

Course Code	Course Title	Contact Hours		Credit Unit	Status	Pre-requisite	Remarks
ABEN502	Agricultural Drainage	15	45	2	Core	ABEN405	
ABEN508	Farm Water Supply and Management	15	45	2	Core		
ABEN546	Sustainable Bio-energy Systems and design techniques	15	45	2	Core	ABEN447	
ABEN530	Farm Electrification and Environmental Control	15	45	2	Core		
ABEN544	Food Engineering	15	45	2	Core		
ABEN594	Computer Applications in Agricultural and Bio-Resources Engineering	15	45	2			
ABEN598	Final Year Project	-	-	3	Core		
Electives		30		2	Elective		Restricted
Total				17			

List of Restricted Electives:

WREN506	Elements of Public Health	2
CVEN302	Theory of Structures II	2

14.2 Course Description

MATH101: Sets and Number Systems (2 Credit Units CU)
Elements of set, universal set, empty set, etc Cartesian product; Finite and infinite sets; Venn diagram; Cardinal number, power set, Disjoint set, etc. Relation, mapping and functions; Binary operations, Structure of number system.

MATH103: Trigonometry and Coordinate Geometry (2 CU)
The trigonometric functions, Special angles, Inverse trig functions, Identities. Additions formulae for trig functions, Trig functions of multiple and half angles, the Factor formulae. The sine rule, heights and distances. Systems of coordinates; Cartesian coordinates. Lengths parallel to the axis, Gradients, and Division of a line in a given ratio. Equation of a straight line: Gradient and one-point form, General equation, the Point of intersection, Line through the mid points of two lines, parallelism, etc. The Circle: Equation, etc.

MATH105: Differential and Integral Calculus (2 CU)
Functions: Definition, Even and odd functions, Periodic functions, transcendental functions, Polynomial functions. Limits and continuity of functions. Graph of a function. Differentiation; Derivative, Differentiable functions. Algebraic properties of derivatives; Sum, Difference, Product Quotient and chain rules. Higher order differentiation. Integration; Definite integrals, Techniques of integration. Partial fractions.

MATH102: Algebra (2 CU)
Principles of Mathematics Induction: Application to sequences and series. Linear, Quadratic and other Polynomial function; The meaning of/X/. The modulus of real number X Elementary properties of quadratic functions; roots of quadratic equations. Application to symmetric functions, Polynomial functions of 3^{rd} and 4^{th} degrees provided they can be reduced to a quadratic or factorized by the reminder theorem. Theory of indices and Logarithms surds: Solutions of simple exponential and Logarithmic equations, change of base; Partial Fractions: Application to summation of series and integration; Sequences and series: Limits of sequences (Rigorous treatment not required). Convergence of series: Illustration by simple examples of convergence of geometric series and series obtained by the partial fractions and the binomial series; Permutations and Combination: Simple examples. The Binomial Theorem and its proof for a positive integral index. Use of the binomial theorem for any rational index; interval of convergence. Applications to approximations and errors. Series expansions for e^k for all x and In (1+x) for $-1<x<1$.

MATH104: Conic Sections and Applications of Calculus (2 CU)
Parabola. Ellipse. Hyperbola. Rectangular hyperbola: Focus-directrix properties, Cartesian and parametric equations, Applications. Determination of locus of a point. Equations of tangents and normal to the conic section. The derivative as rate of change: Velocity, Acceleration and other rates, Curve sketching: Maxima and errors, Newton's approximation. Applications of integration to area and volume determination. Introduction of differential equations: First order differential equations; existence and uniqueness of the solution.

MATH106: Vectors (2 CU)
Notion of a vector. Position vector, Modulus of a vector, etc Algebra of vectors; Addition, Parallelogram law, Triangle law, etc Scalar product: Components of a vector as its scalar product with a unit vector in a given direction. Applications to finding the angles between two lines and other geometrical applications.

STAT102: Introduction to Statistics (2 CU)
Stem and leaf charts; frequency distribution tables; Graphical displays, Measures of central tendency and dispersion. Frequency distribution. Discrete sample space, events; probability. Random variables. Binomial, Poisson and Normal distributions. Bivariate data. Correlation.

PHYS111: Mechanics (2 CU)
Units and Dimensions. Vector and Scalar quantities. Linear Motion, Concept of force. Work, energy and power, Circular motion, Simple harmonic motion. Motion of a rigid body. Static, Gravitation.

PHYS122: Electricity, Magnetism and Modern Physics (2 CU)
Electrostatics; Capacitance; Current Electricity; Magnetic force; Magnetic effects of currents; Electromagnetic induction; Alternating currents. Modern Physics; electronics.

PHYS124: Geometric and Wave Optics (2 CU)
Reflection and refraction; the prism: Lenses and their construction; Spherical mirror; Dispersion and the spectrometer, Optical instruments. Wave nature of light.

PHYS131: Heat and Properties of Matter (2 CU)
Structure of solids, liquids and gases. Kinetic theory of ideal gases Elasticity, Surface tension. Fluids in motion, Solid friction and viscosity, Head and temperature, Calorimetric. Thermal extension. Transfer of heat.

PHYS 161/162: General Physics Practical I and II (1 CU each)
The introductory courses emphasize quantitative measurements, treatment of measurement errors and graphical analysis. A variety of experimental techniques will be employed. Simple experiment in mechanics, properties of matter, heat, light and electricity are emphasized, which are relevant to the course PHYS 131, 122, and 124.

CHEM112: Introductory Physical Chemistry (2 CU)
States of matter; kinetic theory, colligative properties; structure of solids; crystal lattice structures; thermochemistry; chemical kinetics of first and second order reactions; chemical equilibrium; Buffer solution; hydrolysis constants and solubility products; and electrochemistry.

CHEM132: Introductory Organic Chemistry (2 CU)
Scope of organic chemistry; types of organic compounds and determination of molecular formulae, alkenes, alkenes, alkynes and simple aromatic compounds; types of organic reactions; phenols; carbonyl compounds; carboxylic acids; and carbohydrates.

CHEM191: Introductory Practical Chemistry I (1 CU)
Basic apparatus; terminologies; safety regulations; basic working skills in the chemical laboratory; acid-base titration; redo titration; weighing and gravimetric analysis.

CHEM192: Introductory Practical Chemistry II (1 CU)
Qualitative analysis of inorganic anions and cation; Organic qualitative analysis.

GENS 101: Nationalism (1 CU)
The concept of a national Nationalism: Concept, Significance, and History; Nigeria: Cultural diversity, Unity, Consciousness, Identity, Influence of foreign culture; Patriotism; Concept, Significance, examples, Basic and characteristics of nationalism and patriotic spirit in Nigeria; Approaches to nationalism and patriotism.

GENS 102: Environmental Health (1 CU)

Introduction to environmental health: concept of environmental health; relationship between health and environment. Relationship between environment and diseases. Environmental hazards and their effects on health. Examples of environmental hazards. Sources of environmental hazards. Effects on human health. Control of environmental hazards. Accident: definition, distribution, types, human factor, causes, control of accident, prevention of accidents. First Aid. Contribution of students to environmental protection. The need, their contributions. Leadership.

Violence at home and Society. Definition of violence, type of violence, causes of violence. Cultural values that constitute violence. Violence in the family. Prevention and control of violence.

Conservation of natural resources. Soil-Air-Water relationship. Soil –Water-Plant relationship. Plant-Animal-Man relationship. Environmental friendly situation. Conservation of renewable and non-renewable natural resources. Need for environmental impact assessment studies.

GENS103: English and Communication Skill (2 CU)
Listening-comprehension; Listening for specific information, Words and expressions, Main idea. Note taking from lectures; Listening for critical analysis; Reading; Skimming and scanning; Reading for speed; Intensive reading; Note taking from texts; Summarization and Synthesis of ideas. Revision. Specific Language needs related to the students' subject areas; English for Science and Technology, English for arts and social sciences, English for Administrative and Business Studies; English for Law, English for Medical and Paramedical Science; The peculiarities of the course are those of specific registers and pattern of structural discourse.

GENS 107: History and Philosophy Science (1 CU)
Introduction: Definition of Science and Technology and their interaction; Origin of Science; African origin of Science; Egyptian Civilization covering technology; The development of Science in Europe and other areas of the world; Development of Social Sciences; Philosophical concepts of society, etc. Modern developments in Science and Technology; Logic and methods; Key concepts, scientific method, making observations; Concluding remarks; a survey of remarkable scientific and technological breaks – through and their impact on society, the quantitative and computer revolution.

ENGG 102: Engineering Profession and Institutions (1 CU)
Development of Professional engineering: History of technology and its effect on society. The engineering institutions, their objective all functions. Data measurement, representation and interpretation, report writing and oral presentation of information. Introduction to Economic: Elementary economic concepts; evolution of economic activity; characteristics of modern economic systems.

COSC101: Programming in Basic (2 CU)

Basic computer concepts; problem solving on the computer; Characters, Constants, and Variables. Arithmetic expressions; BASIC Statements; BASIC Function; The PRINT statement; Entering data; Transfer of control statements; Repeating or looping; Subscripted variables of the DIM statement; Subprograms; Matrix commands.

CHEM 121: Introduction to Inorganic Chemistry (2 CU)
Periodic table (gradation of physical and chemical properties within the table, the first transition elements series, comparison of chemistry of the elements of periods II and III); transition metal complexes (nomenclatures, isomerism and hybridization involving orbital).

200 LEVEL

MMEN 201: Material Science (2 CU)
Structure of atoms. Bonding forces. Structure of matter; including mention of wood, cement and plastic. Electrical properties; conductors, semi-and supper-conductors. Magnetic properties. Elastic-plastic deformation of materials. Fatigue. Creep. Hardness. Thermal capacity, and conductivity. Thermo-couple phenomenon. Temperature consideration in the choice of materials. Corrosion phenomenon and its prevention. Structure of crystalline materials. Solidification. Mechanical working. Liquid and solid solutions. Introduction to the concepts of phase equilibrium. Micro-and Macro-structure of materials. Cement, concrete, wood, rubber, plastics and resin.

ABEN 202: Introduction to Agricultural and Bio-Resource Engineering (1 CU)
Introduction to agricultural and bio-systems engineering profession; case studies of engineering design problems with a biological component. Exploration of career opportunities and ethical framework for the profession. Conservation of mass, and sustainability, steady-state and stability analysis.

MEEN 201: Engineering Graphics (2 CU)
The principles of Engineering Drawing, Engineering Lettering, Figures and Types of lines (BS-308-1972, part 1, 2, 3) Dimensioning, Useful geometrical constructions. Principles of tangency, Laci-conic sections (ellipse, hyperbola, and parabola). Cycloids, epicycloids, hypocycloids, involutes, helices. Orthographic projection (1^{st} and 3^{rd} angle orthographic projection).

MEEN 202: Engineering Drawing (2 CU)
Isometric projection. Free-hand sketching. Sections and sectional views. Auxiliary projections. Interpenetration of surfaces. Development of surfaces. Screw thread and threaded screwed fastenings. Conventional representation on the threaded elements on drawing.

MEEN 204: Strength of Materials I (2 CU)
Direct stress and strain: tension, compression. Hook's Law, elastic constants, strain energy impact load, thermal stress. Geometrical properties of areas: Centroid, first and second moments of area parallel axis theorem, product moment of area, cross-sections having and not having axes of symmetry. Simple Theory of bending: Classification, bending moment, and shear force diagrams, relations between bending moment, shear force and load, bending stress; section modulus; strength requirements; combined bending and tension/compression; eccentric loading; unsymmetrical bending; compound bars; deflection of beams. Simple shear: Shear force; shear stress; shear stain; Hook's Law; technical shear. Torsion of circular cross-sections: Torque diagram; angle of twist; shear stress due to torsion; transmission of power by shafts; helical springs. Special problems: Statically indeterminate problems, thin cylinders and spheres under pressure.

MEEN 206: Fundamentals of Dynamics (2 CU)
Kinematics of Particles: Rectilinear motion, plane curvilinear motion, appropriate choice of reference frame in solving problems. Relative motion-translating axes. Kinetics of particles: Newton's Second Law of Motion: Work and Kinetic Energy Method for deriving equations of motion; Impulse and Momentum. Kinetics of systems of particles: Defining equations, steady mass flow; variable mass problems. Plane Kinematics of Rigid Bodies: General equations of motion; Translation; Fixed-axis rotation. General equations of motion; work energy relations; impulse and momentum equations for rigid bodies.

MEEN 208: Basic Thermodynamics (2 CU)
Dimension and Units (S.I. Units); Fundamental Concepts: Energy, i.e. Potential, Kinetic, internal; combustion engines, property, state, process and cycle system and surroundings; pressure; temperature, zeroth law, arbitrary nature of temperature, scales; equilibrium, reversibility, heat and work.

First Law of Thermodynamics: As applied to closed and flow systems, and in the cycle and non-cyclic (process) forms as well as in the differential form; Application to particular processes of constant volume; constant pressure, isothermal, adiabatic, polytrophic and throttling; the flow energy equation and its applications to turbines, compressor, nozzles, boilers, condensers, heat exchangers (treated as black boxes only).

Second Law of Thermodynamics: Definition of heat engine; cannot cycle; thermodynamic temperature scale; entropy (as a property). Properties of Pure Substances: Condensable fluids:

T-P diagram, P-V diagram; two-phase mixture- T–S diagram; H-S diagram; the use of property tables and diagrams. Perfect Gases: Properties of perfect gas; entropy changes in perfect gases.

CVEN 201: Introduction to Structural Analysis (2 CU)
Concept of structural analysis. Stability and determinate structures. Bending moment and sear force diagrams for determinate beams. Beam deflection. Framework deflections and strain energy in frames. Suspension cables. Determinate arches. Stability of gravity sections.

EEEN201: Electrical Circuit and Field Theory (2 CU)

Circuit theory: Definitions and units of charge, current, voltage, power and energy. Circuit modes. Experimental Laws and simple circuits: Ohm's laws, Kirchhoff's law. Analysis of a single loop circuit. The single-mode pair circuit, resistance and source combination. Voltage and current division. Useful techniques of circuit analysis: Nodal analysis, Mesh analysis. Thevenin's and Norton's theorems. Links and loop analysis. AC circuit Analysis: Mean and root mean Square (rms) values of an ac waveform. Peak values of waveform. Relationship between peak and rms values. Representation of alternating voltages and currents as phasors. Summation of ac quantities using phasor diagrams. Average power, instantaneous power. The basic passive elements: terminal relations for R, L, C and M. Impedance and admittance.

Field theory: Electric charges, Coulomb's law, Gauss law. Electric field. Electric dipoles. Potentials. Capacitance. Electrical work and Energy. Magnetic forces between current elements. Biot-Savart law. Ampere's law. Lenz's law. Lorentz law. Motor principle. Generator principle. Magnetic work and Energy. Inductance. Reluctance.

EEEN 202: Electronics, Measurement and Transducers (2 CU)
Electronics Conduction in solids; insulators, semi-conductors and conductors. Intrinsic and doped semi-diodes. Two-port electronic devices vacuum triodes, field-effect transistors and bipolar, transistor. Principles of electronic amplifiers, rectifiers, filters and modulator. Linear modes of electronic devices. Transistor circuits for common base and common-emitter configurations. Input/output impedance, gain and h-parameters. Characteristics of components used in electronic circuits. Basic logic circuits.

Measurement and Transducers: Measurement of and instruments: General principle of measuring instruments. Torques and springs relationship. Types of instrument: Ammeters, Voltmeters, Watt-meters, Watt-hour-meters. Cathode-ray oscilloscope and its applications. Simple treatments of Amplifiers and the transistor as a circuit element. Power supplies and their applications.

Transducers and Bridge measurement: Measurement of resistance, measurement of frequency. Electrical pressure transducers. Displacement transducers. Electrical pressure transducers. Displacement transducers. Electrical temperature transducers. Measurement of speed by electrical means.

EEEN 203: Electrical Machines, Power and Installations (2 CU)

Transformers and Rotating Machines: Basic principles: Induction (Faraday's law), interaction (Biot-Savart Law), and alignment. Generalized Basic Units: magnetic, electrical, mechanical and thermal. Qualitative analysis of the production of torque and rotation of electric machine. Generalized torque equation and electric machine and simple calculations. Transformer: Constructional features, types, connections (including 3-phase type) and application of various

types. DC machines: constructional features, types (separated excited, shunt, series and compound), (single and 3-phase), types of rotors (squirrel cage and wound or slip-ring) and application. Synchronous Machines: constructional features, types (salient or non-salient poles types) and application. Brief introduction and application of special machines: AC, commuter machines, general purpose machines, repulsion machines, linear motors, etc.

Electrical Power Generation, Transmission and Distribution: Types of power stations, Power generation and transmission problems (flow diagram representation from generator to consumer terminals). The synchronous generation and its importance in power generation from small types in motors to huge types in power station.

Transmission of electric power: The H.T. overhead lines and step up power transformers in overhead lines (330KV lines). Distribution of electric power using overhead lines and underground cables (show typical underground cables). The distribution transfers in power distribution and their use in the design of estates A.C and DC supplies. The use of AC in preference to DC; stressing the importance of the transformer. Single and 3-phase, 4-wire circuits, the meaning of impedance (X), volts (V), power ohms and power factor (PF) in AC supply systems.

Wiring System: Supply, control and distribution in buildings including intakes, diversity, wiring circuits for lighting using loop method, number of points on one circuit, wiring socket outlets. Conductors and cables including sizes in various types of installation. Wiring systems including conduct systems, rubber and PVC soothed systems; components and accessories used in wiring systems, ceiling roses, lamp holders and switches etc.

Safety precaution including the need for safety, the use of circuit breakers and fuses, the importance of earthling. Illumination: Principle of illumination, definition of terms and the inverse square law. Lare and its effects. Types of lamps and lamp fittings. Principle of lighting design and illumination requirement for various types of usual tasks.

WREN 201: Fluid Mechanics 1 (2 CU)

Properties of Fluids: Pressure, viscosity, surface tension, compressibility etc.

Hydrostatics: Variation of pressure with position in a fluid, equilibrium of a fluid of constant density, measurement of pressure, barometer, monometer, the Bourdon gauge, thrust on plane and curved surfaces, buoyancy, stability of floating and submerged bodies.

Principles of Fluid Motion, Continuity, Bernoulli's equation, energy transformation in a constant density fluid, energy correction factor, streamlines, Pressure variation perpendicular to streamlines, flow through a sharp edged orifice, pilot tube, venturi meter, nozzle and orifice meter, notches and sharp crested weirs.

Moment Equation: Momentum equation for steady flow, momentum correction factor, application of the momentum equation, force caused by a jet striking a surface, force caused by flow round pipe bend, force at a surface, force at a nozzle and reaction of a jet under short wheel as an example of a simple hydraulic machine.

CHEN 202 Introduction to Management (1 CU)

Introduction (definition, uses and types of organization, need for management, the manager and its functions); Planning, decisions makings, organizing, directing and leadership (motivation, communication and leadership); control.

MATH 241 Calculus I (3 CU)

Sequences and Functions: Infinite sequences and their limits, a short recollection of elementary functions and their properties, limits and continuity of functions of a single independent variable.

Differential Calculus: Definition of the variable; geometrical and physical interpretation of the derivatives, techniques of differentiation, Rolle's theorems and the mean-values theorem, Taylor and Maclaurin's series expansion, application of differentiation; maxima and minima of function of a single independent variable, curve sketching in Cartesian rectangular coordinates. L'Hospital rule for evaluation of limit of functions in the indeterminate forms, tangents and normals, curvatures and evolutes of plane curves. Leibniz's formula for finding the nth differential coefficient of a product of two functions.

Integral Calculus: Indefinite integral, techniques of integration- change of variable, integration by parts and reduction formulae, integration of rational functions (standard integral and methods of partial fractions), the definite integral interpretation and properties; application of integration, average values of a function, finding lengths of areas, planes areas, volumes of solids of revolution area of surface of revolution, pressures, etc.

MATH 242 Calculus II (3 CU)

Infinite Number Series and their properties, tests of convergence complex number series.

Improper integral: improper integral of types I, II, and III. Evaluation of improper integral, convergence of improper integral, convergence in the Cauchy Principal values, test of convergence.

Partial Differentiation: Partial derivatives of applications.

Ordinary Differential Equations: First Order differential equations with variables separable, exact equations and integrating factors; linear first order equations and those reduce to linear form. The Bernoulli equation, applications (geometrical and physical situations).

MATH 243 Methods of Linear Algebra I (2 CU)

Complex Numbers: Addition, multiplication, division argand diagram, polar representation, De-Moivre's theorem. Vector Algebra: Definition of vector and physical examples, addition, multiplication, application in geometry, Vector Analysis: Cartesian and polar coordinates in two and three dimensions. Vector functions of a real variable, continuity and differentiation, application to curves and surfaces in 3 space equation of straight lines, planes and sphere, tangent and normal to a curve, tangent and normal to a surface.

MATH 244 Methods of Linear Algebra II (3 CU)

Determinants and matrices: definition and properties of the determinant, its evaluation, matrices addition, multiplication by scalar, adjugate, inverse of non-singular matrix, rank and its evaluation. Simultaneous linear equations, consistency, linear dependence, solution (including Cramer's rules), Eigen values and Eigen vectors, special matrices, symmetric, skew symmetric, orthogonal, etc.

300 LEVEL

ABEN 302: Agricultural Surveying (2 CU)

Introduction to Agricultural surveying; classification of surveying. Measurement of horizontal distances: Chaining/Taping, accessories; Error in chaining/taping and corrections. Levelling, types of levelling; levelling instruments, computation of elevations; errors in levelling. Contouring: characteristics of contour lines and use of contours, plotting of contours, locating ridges and valley lines. Measurement of areas and volumes and areas. Angles and Direction: types of horizontal angles, bearings. Traverse survey and computations.

ABEN 303: Agricultural Climatology for Engineers (2 CU)

Introduction of agricultural climatology; Weather parameters: rainfall, temperature, relative humidity, wind speed, solar radiation, sunshine hours; measurement of weather parameters and equipment; methods and tools for data analyses. Evapotranspiration; measurements and empirical equations Relationships between climate and agriculture in resource assessment; water budget analysis; meteorological hazards; Crop-yield modelling, and impacts of global climate change.

ABEN 305 Soil Mechanics for Agricultural and Bio-Resources Engineers (2 CU)

Soil as a multipurpose system: classification for agricultural and engineering purposes; classification on the basis of index properties; Particle size analysis. Soil texture. Soil structures; Quantitative definitions of soil solids, soil water and soil air. Concept of soil suction and soil water potential. Soil moisture retentive curves. Concepts of available soil water. Movement of water in soil. Hydraulic conductivity. Infiltration of water in soil. Soil temperature. Seepage analysis in one and two dimensions. The principle of effective stress: shear strength, soil compressibility. **Field and laboratory practical**.

ABEN 312: Agricultural Power and Machinery (2 CU)

Introduction to farm power and machineries; Classification of machinery used in production and processing of crops; Primary and Secondary tillage equipment ploughs, rotary tillers and sub-soilers; planting equipment, fertilizer application equipment; plant protection equipment: harvesting practices cum equipment; threshers and winnowers; combine harvester.

Sources of farm power; introduction to tractor systems. Design consideration of agricultural machinery; tillage force analysis, design of tillage tool; mould board and disk type implement, rationale of design and selection.

ABEN314: Agricultural Engineering Workshop Practice (2 CU)

Workshop organization; measurement-accuracy significant figures: tolerances; Workshop, measuring tools. File and metal saws. Abrasives, Grinders and Grinding operations. Drills and Drilling, types of Drilling machine, Welding theory, metallurgical aspects; soldering-types of solder and uses.

Wood working practices, carpentry-lumber selection, fasteners, joints, shop wood working tools, economics; metal lathes-cutting tools, application of lathes, threading tapping. Milling machine-types of millers, applications. Broaching application. Forging processes-principle of forging, application; metal shearing and forming principles and applications. Projects involving use of material covered.

ABEN 342: Engineering Properties of Biological Materials (2 CU)
Physical, thermal, and electromagnetic properties of biological materials necessary for the design and analysis of processes and equipment in bio-systems. Importance of physical properties in design of equipment and processes etc. Structure of cell and walls, relationship between turger pressure rigidity, retention of water. Physical characteristics; shape, size, volume and density etc. Basic concepts of rheology and theological properties of bio-materials. Theological models and their equations. Angle of repose and angle of internal friction and flowability of granular materials. Conveyors and elevators, fluidization of particulate materials. Size characteristics, fineness modulus and uniformity index, Kick's laws for energy requirement in size reduction. Size reduction procedures and devises. Grade factors, cleaning and sorting of agricultural materials. Aerodynamic and hydrodynamic properties of particulate materials.

AGRN 399: Elements of Crop Production (2 CU)
Classification of crops, essentials of crop growth, soil, climate and their relations to crop growth: tillage, seed and sowing, manures and fertilizers: types and requirements for different crops, irrigation and drainage, weeds and weeds control. Harvesting, processing, and storage of important crops.

ANSC 304: Animal Production (2 CU)
Types of livestock for eggs, milk, meat and wool. Distribution of Nigerian livestock in relation to climate, ecology and health factors. Principles of animal feeding and nutrition. Forage preservation (Silage hay, other forage crops). Housing and management of livestock (growing animals, work bulls, Stud animals, other). Livestock improvement: Animal environmental requirements. Physiological requirements of livestock. Homeostasis and homoeothermic of animals. Temperature and humidity effects on livestock. Psychometric relations, heat and moisture load estimation.

MEEN 301: Machine Design 1 (2 CU)
Introduction to machine design: Sciences involved; Components: units and assemblies of machines main trends in developments of machine design. Selection of materials sequence in machine design. Loads in machines. Factor of safety. Allowable stress. Economy in design.

Standards in Machine Design: N.S.O and I.S.O. Standards, System of fits and limits. Dimensional and geometrical tolerance. Inter-changeability. Surface texture; marking machine surface. Standard machine elements. Marking of reverted, welded and threaded joints on engineering drawing.

Design of Joints: Riveted Joints: Friction effect; strong and tight-strong and tight-strong joints for structures and pressure vessels. Welded Joints: Methods of Welding; strength calculations of welded joints. Threaded Joints: Classification; standards. Combined loads. Forces and deformation of joined parts. Power screws; Strength and efficiency. Key and pin joints: unstrained. Strained, fixed and sliding joints.

Short Design Assignments: 1) Jockey Pulley Assembly drawing; 2) Knuckle joint.

Scope: Calculation, workshop and assembly drawings, technical description on production, operation and maintenance.

MEEN 302: Machine Design II (2 CU)

Shafts and Axles: Classification, loads, fatigue considerations materials. Application of strength theories. Types of shafts. Axles and shafts of Uniform strength. Stiffness of shafts (deflection and tensional stiffness). Transverse vibration: Critical velocity of shafts, semi-graphical method of shafts design. Geometry of shafts. Power transmission. Types of drives; belt transmission; Euler's equation stresses in belts; flat belt, v-belt and toothed belt. Geometry of belt pulleys. Toothed gears: Classification and shapes of teeth. Spur gears. Geometry. Standard modules. Calculations for strength and wear. Materials selection; velocity, machining, lubrication. Gear Trains: Velocity ration and efficiency; service life; minimum number of teeth. Diagrammatic (simplified) representation of various drives. Toothed gears in engineering drawing, dimensioning. Cast and welded gears.

Short Design Assignments: 1) Pressure vessels; 2) Screw Jack.

Scope: Calculation, workshop and assembly drawings technical Description on production, operation and maintenance.

MEEN 305: Strength of Material II (1 CU)

Thick Cylinders: Land's Theory: Open and closed conditions for cylinder under internal pressure; compound cylinder. Bars of small initial curvature: Bending moment; shear force and normal Force diagrams; leaf springs. Bears of large initial curvature: Theory and simplifying assumption; crane hooks. Fatigue of materials: Forms of materials: Form of stress cycle; S-N curves; Smith and High graphs; safety factor.

MEEN 307: Dynamics of Machinery II (2 CU)

Force analysis of machinery: Inertia force, inertia torque. Methods of linkage force analysis, engine force analysis. Kinematics of the hook's joining. Kinematics and Kinetics of centrifugal and inertia type governors. Balancing of reciprocating masses: Primary and Secondary forces and moments; in-line engines; vee and radial Engines; method of direct and reverse cranks. In introduction to the Kinematics and kinetics of can mechanisms.

MATH 341: Differential Equations and Transforms (3 CU)

Exact equations, linear equations of first and second order with variable coefficients, geometrical interpretation, Isoclines. Statement of existence theorem. Series solution of differential equation with non-singular points. Series solution of Bessel equation and properties of Bessel functions of the First king. Series solution of the Degendre equation, and properties of legendary polynomials. Fourier integrals and transforms. Laplace transform and its Applications to the solution of differential equations.

STAT 343: Statistics (2 CU)

Axiomatic definitions of probability. Basic rules of probability. Bayes formula. Random variables. Probability distributions: rectangular, hypergeometric Binomial, multinomial. Poison, normal, geometric exponentials, beta and gamma. Mathematical expectation. Mathematical expectation. Main variance and moments. Bivariate distributions. Joints, marginal and conditional distributions, correlation coefficient. Bivariate normal distribution. Regression and correlation. Method of least

squares, Regression curves. Random sampling. Sampling distributions. Expected values. Standard error. The central theorem. Student's-t, x2 and F distributions. Estimates of Parameters. Maximum likelihood principle. Confidence intervals for Mean, proportion, variance, difference of means, difference of proportion, and ratio of variances. Elements of tests of hypotheses: Critical region, significance level, type I and Type II errors. Power function. Testing the mean of a normal population when variance is known and unknown. Testing the difference of means of two normal populations having equal but variances. Thirsting the variance of a normal populations. Tests of independence in contingency tables. Tests of goodness of fit.

MTEN 316: Metallurgy for Engineers I (2 CU)
Review of topics like structure of metals and metal alloy systems. Elastic and plastic deformation of metals Inelasticity (internal friction). Mechanism for permanent deformation metals: Slip, Twinning, Crain boundary slinging, Precipitation hardening and recrystallization, Residual stresses, Iron and Steel production, Alloy steels; effect of metallic and non-metallic alloying components on steel properties. (Spring, high-speed, heat resisting, etc. steels). Cast-iron & Cast steel; properties and applications. Heat treatment of steels. Case hardening and surface treatment.

QTYS 309: Developmental Economics (2 CU)
Introduction to economics: Elementary concepts, evolution of economic activity. Characteristics of modern economics concepts. Basic Economics, economics of taxation and public expenditure, business organization, industrial concentration and government control. Location of West African industry and trade: background of West African economy. Economic planning, development problems. The banking system: Money and Capital Market. Inflation, cost-benefit analysis.

CVEN 301: Theory of Structures I (2 CU)
Review of bending moment and shear forces in determinate beams. Frame and Trusses. Principles of Indeterminacy and Static stability of Plane frame and Trusses. Moment Area Method. Force (flexibility) method. Application of indeterminate beams and simple frames. Flexibility coefficient practical interpretation. Compatibility equations. Virtual work method principle of virtual displacements. Application to beams, trusses and plane frames. Use of 1^{st} and 2^{nd} theorems of Castiglione in structural analysis.

CVEN302: Theory of Structures II (2 CU)
Influence lines for reactions, shears and bending moment in determinate beams lattice girders and three hinged arches. Maximum moments and shear envelopes slope deflection method. Moment distribution method. Analysis of indeterminate beams and frames. Analysis of two hinges tied and fixed arches including numerical methods. Introduction to plastic analysis. Estimation of yield and collapse loads for simple beams and lane frames using virtual work methods.

MEEN 309: Applied Thermodynamics (2 CU)
Reciprocating Compressors: Brief mention of need for economic delivery pressures of reciprocating compressors. Distinction between reciprocating and rotary compressors and applications including advantages and disadvantages of each. Compressor cycles. Staging of compressors and efficiency (isothermal and isentropic). Inter-cooling, after cooling and optimum interstate pressure. Fixtures: Mixtures of perfect gases. Dalton and Agama Laws. Gabb-Dalton

Law. Properties of mixtures. Humid air (psychometric) the psychometric claret. Application to air-conditioning cooling towers and storm condensers.

Combustion Processes: Fuels. Calorific values for fuels. Reaction equation (air fuel ratio). Analysis of products of combustion. First law of combustion processes. Boiler and plant efficiency.

COSC 344: Basic Computer Knowledge and FORTRAN Programming (3 CU)
Binary, octal and hexadecimal number systems. Conversion. Complement of numbers. Representations of negative numbers. Digital computers. Main functional elements of a computer. (Memory, control and arithmetic units, input-output devices; backing storages). Information in the core store. Binary coded Decimal. Fixed and floating point representations. Programming Languages (short summary of the machine-code, assembly, machine and Problem oriented language). The flow-chart language. Loops. Iteration. The basics of FORTRAN, Numerical data. Arithmetic. Arrays. Input-output. Control statements. Segmentation of programmes, statement function, function and subroutine segments. (In addition 12 hours of practical are necessary).

MEEN 306: Dynamics of Machinery I (2 CU)
Kinematics of mechanisms: In a rotating reference frame; Ceroilis component of acceleration. Kinematics of simple, compound and spicyclic gear trains. Balancing of rotating masses. Crank effort and crank effort diagrams, Flywheels. Friction: Friction clutches, belt drives and band brakes.

400 LEVEL

ABEN 401: Irrigation I (2 CU)
Overview of irrigation systems; Irrigation structures: conveyance, control, distribution and application; water measuring structures. Pumps and pumping: centrifugal pumps; power requirement, pumping cost. Basic soil-water-plant relationships, Consumptive use, crop water requirements, Irrigation efficiencies, frequency and amount of irrigation; Methods of irrigation: surface/gravity, sprinklers, trickle/drip, subsurface. Basic flow equation relevant to irrigation, Design of irrigation channels, grassed channels. Problems associated with irrigation: water logging/poor drainage, salinity/drainage.

ABEN 403: Agricultural Hydrology: (2 CU)
Hydrological cycle, brief history of development of hydrology. Rainfall-runoff of agricultural lands. Stream gauging and stage discharge relationship, Hydrographs; characteristics of hydrograph, hydrograph separation and its analysis, hydrograph synthesis and derivation of unit-hydrograph. Stream flow routing. Groundwater; sources of groundwater, movement of groundwater, aquifers, permeability and transmissibility. Watershed management, influence of land treatment of watershed hydrology.

ABEN 405: Hydraulics for Agricultural and Bio-Resources Engineers (2 CU)
Fluid Flow-Continuity, Bernoulli, Darcy, Wiesbach, Chezy, Meaning, and Hazen-Williams' Equations; Laminar and Turbulent flows; Gradually and rapidly varied flow; Channel Roughness; Manning's Roughness Coefficient; Flow Measurements; Forces acting on Pipes at bends and Changes in Cross-section; External loads on buried pipes.

QTYS 421: Law for Engineers ((1 CU)
The Nigerian legal system; Industrial safety laws; Electricity supply law; water and public health laws; company and Partnership laws; copy rights, patents, and trademarks. The law relating to employers-employee contract laws; land acquisition law.

ABEN 443: Biomass Conversion and Bioenergy Feedstock Production (2 CU)
Agronomic, economic, technological, and environmental principles involved in bio-energy feedstock production. Cultivation, harvest, transportation, and storage of agricultural and forest biomass. Physicochemical and biological pre-treatment. Biomass conversion to alcohols, biodiesel, bio-oil, syngas, and other value.

ABEN 497: Technical Report Writing (1 CU)
Introduction to report writings. Types of reports. Methodology of report writing: Abstract, Introduction, Literature Review, Materials and Methods Results and Discussion, Summary, Conclusion & Recommendation. References: styles of referencing; footnotes and headers; Table of Content; Tables and graphs: captions, styles of presentation. Preparing power point presentation.

ABEN 431: Instrumentation (2 CU)
Engineering application of measurements, functional descriptions of measuring instrument, fundamental methods of measurement, functional elements of an instrument, types of distributions, mean, variance, standard deviation, least square criteria, absolute error, differential equation, D or P operator, Laplace transformation, system response, generalized model for instrument, first order system, step input, ramp input, transient and steady state response; second order system response, damping, zero order (displacement measuring potentiometer), bridge circuit, calibration methods, shunt resistor calibration, error, precision and accuracy, flow measurement, meters, variable head and area meters, displacement meters, mass velocity meters, thermal meters, stain measurement, strain gauges, velocity measurement.

ABEN 413 Land Clearing and Development (2 CU)
Land resources and land use. Acts related 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 earth moving mechanics**.**

STAT443: Design and Analysis of Experiments and Quality Control (3 CU)
Basic concepts of experimental design. One –way, two –way ANOVA, CRD, RCBD, LS, GLS. Estimation of missing values, simple factorial experiments. Process Control, Product Control, Comparison of different sampling plans. Floating- point Arithmetic. Acceptance Sampling, Inspection by Attributes, the OC Curve, Sampling and their section. Inspection by variables. Test of Significance in quality Control. Reliability and life testing.

CVEN 407: Design of Hydraulic Structures (2 CU)
Eccentrically loaded structures. Limit state of cracking. Stress analysis for gravity, arch, earth fill and rock fill dams. Spillways and reservoirs. Design of water tanks and retaining walls. Criteria for stability.

COSC 441: Numerical Analysis (3 CU)
Accuracy in numerical calculations, errors, significant figures, calculation of sin, cos and exponential s by Taylor expansion. Interpolation. Newton's forward, backward and central differential formulae. Numerical differentiation, numerical integration, trapezoidal rule, Simpson's rule, automatic selection of interval size, Newton-Cote formulae. Solution of algebraic and transcendental equations, graphical, bisection, interval, Newton-Raphson solution of simultaneous equations, (Gauss and Gauss-Siedel) eigenvalues and eigenvectors). Numerical solution of ordinary differential equations. Methods of Euler, Picard, Taylor ordinary differential equations. Introduction to partial differentiation.

CHEN 409 Financial Management (2 CU)
Financial planning and control (balance sheet, profit and loss account, ration analysis, profit planning, financial forecasting, budgeting); management of working capital (working capital sources and forms of short-terms financing); capital structure (sources and forms of long term financing, financial structure and leverages); investment decision (the interest factor , cash of capital budgeting decision).

500 LEVEL

AERS 503: Farm Management and Agricultural Extension (1 CU)
Farm management; basic principles and application to farming business; systems of farming and their determination factors, method of measuring farm efficiency; farm records and accounts, complete cost accounting

Basic concepts of sociology and their application on rural life, Nigerian rural society, farms and farm organization, meaning of agricultural extension organization and administration, communication in extension, extension teaching methods, extension programme planning and evaluation.

ABEN 501 Irrigation System Design, Management and Evaluation (2 CU)
Design of irrigation systems: border, furrow, basin, sprinkler, trickle. Trick/drip. Basic water management concepts; Irrigation scheduling: principles and objectives; deficit irrigation scheduling methods: ET-deficit irrigation, Stress Day Index (SDI), Crop Critical Growth Stage (CCGS). Crop Yield-Water Use modelling techniques: concepts, formulations and evaluation. Quality of irrigation water. Reclamation of saline and alkali soils. Feasibility studies. Irrigation systems evaluation: principles and objective; key parameters affecting irrigation efficiencies. Measuring devices and method used in evaluation and interpretation.

ABEN 502: Agricultural Drainage (2 CU)
Drainage requirements of crops; surface drainage system; subsurface drainage: theory and types of drainage materials. Depth and spacing of drains. Interceptor drains. Sizes of tile drains accessories. Tile drains: installation loads on conduits, cost of drainage system, maintenance. Drainage by pumping. Drainage envelope materials and envelope design.

ABEN 503: Soil and Water Conservation (3 CU)
Introduction, definition. Types of erosion. Erosion phases: detachment, transportation, deposition. Soil erosion by water: splash, sheet, rill, gully, and channel erosion and its effects. Major factors affecting soil erosion by water. Rainfall characteristics, intensity, duration, amount kinetic energy, erosivity, erodibility. Soil erosion by wind. Measurement of erosion: Universal Soil Loss Equation. Control of water and erosion: Biological and Engineering measures of soil erosion control: land use, soil management, crop management; contouring, locating contour lines, field layout, limitations; strip cropping types and field layout; terracing, types, design, construction; grassed waterways design and maintenance; gully control, stabilization, diversion, design of control structures. Erosion control on grazing land.

ABEN 544 Food Engineering (2 CU)
Description: Unit operations, process engineering, equipment, and industrial practices of the food industry. Manufactured dairy products: thermal processing, pipeline design, heat exchange, evaporation, dehydration, aseptic processing, membrane separation, cleaning, and sanitation. Analysis and design of unit operations and complete systems for handling, processing, and manufacturing bulk, granular, and solid food products. Material variability microbial, chemical, and physical hazards.

ABEN 546: Sustainable Bio-energy Systems & Design Techniques (2 CU)
Engineering design process. Problem identification, analysis, design modelling, materials, cost estimation, and final specifications. Safety, environmental, and ethical considerations.

Bio-refinery analysis and system design. Life cycle assessment to evaluate sustainability of bio-energy systems. Current policy regulating the bio-economy and system economics. Product commercialization.

ABEN 530: Farm Electrification (2 CU)
Use of electricity in the farm. Farm stead wiring, distribution and Transmission. Control record and measurement of electricity and electric equipment. Selection of motors with respect of performance and usage. Control systems: automatic control and feedback. Introduction to electronic circuits and their uses in the farm.

ABEN 523: Farm Structures (2 CU)
Building materials and their properties. Farm stead and its problems. Farm stead planning with special reference to Nigeria. Requirement for Farm structure: Housing for beef cattle, dairy cattle, Swine. Poultry Structures. Other agricultural structures on the farm. Structural analysis and design. Cost estimation. Economic theory to farm building.

ABEN 513: Agricultural Machinery Management (2 CU)
Power and machinery management; field capacities and machine- power matching criteria, systems approach in farm machinery management, Nigerian Standards Organization & NSO standards on farm equipment; Machinery evaluation, interpretation of test data; scheduling of operations equipment, replacement & inventory control- Review of test cases on machinery evaluation and management; uniqueness of equipment of Nigerian farming systems, overall farm mechanization trends in Nigeria.

ABEN 515: Agricultural Power (2 CU)
Review of agricultural power sources used at farm animal, human, electric, I.C. engine, solar, wind, water energy conservation system relative efficiencies; criteria of selection and limitations. I.C. engine usage, tractor power cutlets-PTO, belt, hydraulic and drawbar design considerations and established standards. Traffic and traction. Electric motor selection criteria. Animal power, sources, draft characteristics, human power and ergonomic considerations in man-machine- environment system.

ABEN 521: Processing and Storage of Agricultural Products (3 CU)
Psychometrics, Laws and terminology. Use of achromatic chart, moisture content and equilibrium moisture content. Principles and equipment for drying. Thin bed and deep bed drying. Respiration of grain. Control of insect infestation. Moisture migration in bins. Grain quality deterioration. Hydro handling of fruits and vegetables. Drying and drying rate prediction, Refrigeration and thermodynamic analysis of refrigeration cycles. Storage Structures and control of infestations during storage.

ABEN 594: Computer Application in Agricultural and Bio-resources Engineering (2 Cu)
Computer model development; calibration, validation and simulation techniques. Application of computer software pages in different aspect of Agricultural and Bio-resources engineering: irrigation, hydrology, hydraulics, erosion control, machine design, processing of agricultural produce.

ABEN 508: Farm Water Supply and Management (2 CU)

Sources of farm water; Water storage devices in farms: ponds, earth dams and reservoirs, types of embankment, reservoir requirement; design principles, construction and maintenance. Rain and runoff water harvesting and utilization: type of catchments, storage devices, design and maintenance. Sources and treatment methods for small water supply schemes. Appropriate technology in water lifting devices lifting and water treatment for rural areas. Application and importance of small water works.

Water-borne, water-based and water-related disease and their mode of transmission. Individual waste disposal systems, including aqua privies, pit latrines. Septic tanks soak ways, and drain fields, storage, collection, transport and disposal of agricultural and domestic solid wastes. Planning water and sanitation programmes for rural communities and gradual upgrading of such programmes.

ABEN531: Entrepreneurship for Agricultural Engineers (1CU)
Organizational structure of establishments and manufacturing company; Market survey, feasibility studies; Project and contract document; Specifications and planning schedule; Quality control; safety and safety procedures; Entrepreneurship and types of entrepreneurs, factor responsible for successful entrepreneurship; constraints to entrepreneurship.

ABEN 597/598: Undergraduate Final Year Project: (6 CU)
Study of a specific problem in Agricultural Engineering involving integrating knowledge gained from different courses; planning, execution, report writing and oral defence.

MMEN 523: Welding and Brazing: (2CU)

Introduction: role of welding and brazing as manufacturing processes. Welding: types of welding processes, gas, resistant, flash, friction lector-and electro-slag welding, etc. Brief treatment of newer processes such as explosive, plasma arc and electron beam welding, welding rods and fluxes, protective atmosphere, welding defects and weldability of metals and alloys. Effect of welding processes and parameters. Heat treatment of welds.

Design and testing of welding joints: Brazing; scope and limitations, types of processes, brazing alloys, brazing of commercially important ferrous and non-ferrous metals and alloys. Soldering; processes, soldering alloys and application of soldering techniques.

WREN 506: Element of Public Health: (2CU)

Health and personal hygiene: definition, value and changing outlook toward health and hygiene. Measurement of health, individual health, maturity, parental care, family conditions, etc. Epidemiology: The study of community diseases. Conditions giving rise to disease. Infection: Method of spread, sources of spread and conditions affecting spread. Protection: Natural and artificial methods. Epidemics: Their spread, how they can be controled and their importance. Infectious diseases in the United Kingdom: Their causes, mode of spread, mortality and control methods. Infectious diseases in the Tropical Countries: Their causes, mode of spread, mortality and control methods. Non-infectious diseases: influence of the environment, Bronchitis, lung cancer and various types of poisoning; radiation.

Accidents: roads, factory (industrial) and rehabilitation. Food adulteration and poisoning. Malnutrition: causes, their recognition and control. Mental outlook towards family work and community. Health and community hygiene: historical survey. World Health Organization: its growth and adjustment. Local achievement, local achievement in slums clearance, rodent controls, etc. Health education: its methods and opportunities.

15.0 LIST OF DEPARTMENTAL STAFF

Academic Staff

S/No.	Name	Rank	Area of Specialization
1	Engr. Prof. Aminu Saleh	Professor	Farm Power and Machinery; Renewable Energy; Energy Policy, Utilization and Environment
2	Prof. M. L. Suleiman	Professor	Farm Power and Machinery (Crop Protection)
3	Prof. A. M. I. El-Okene	Professor	Processing, Handling and Storage; Structures.
4	Prof. M. A. Oyebode	Professor	Soil & Water Engineering (Hydrology)
5	Prof. U. S. Mohammed	Professor	Farm Power & Machinery (Traction)
6	Prof. D. D. Yusuf	Professor	Farm Power and Machinery (Tillage)
7	Prof. H. E. Igbadun	Professor	Soil & Water Engineering (Erosion)
8	Prof. M. Isiaka	Professor	Processing, Handling and Storage; Renewable Energy (Solar)
9	Dr. M. Abdulsalam	Reader	Agricultural Waste Engineering

10	Dr. H. Ismail	Reader	Soil and Water Engineering
11	Dr. I. B. Dalha	Senior Lecturer	Bio-System/Bio-Energy Engineering
12	Dr. S. U. Yunusa	Lecturer I	Bio-Resources Wastes Management
13	M. K. Dalhat	Lecturer I	Soil & Water Engineering
15	M. A. Shehu	Lecturer I	Soil & Water Engineering
16	A. S. Ibrahim	Lecturer I	Soil & Water Engineering
17	H. Y. Lawal	Asst. Lecturer	Farm Power and Machinery

Technical Staff (Senior)

S/No	Name	Rank
1.	Moses B. Jesulowo	Chief Technologist
2.	Salihu Ahmed	Chief Technologist
4.	Nasiru Muhammed Lalaye	Chief Technologist
5.	Lydia L. Musa	Principal Technologist
6.	Sani Alhassan	Principal Technologist
7.	Haruna Y. Abdulkarim	Principal Technologist
8.	Suleiman U. Balogun	Principal Technical Officer II
9.	Hassan Usman Mohammed	Principal Technical Officer II
10.	Shuaibu Abdullahi	Principal Technical Officer II
11.	Danimoh Abdulsalam Bashir	Principal Technical Officer II
12.	Samuel Kayode Agunkejo	Principal Technical Officer II
13.	Musa Mohammed Abdullahi	Principal Technical Officer II
14.	Emmanuel O. Odofin	Senior Technical Officer
15.	Hassan I Chori	Senior Technical Officer
16.	Abba Jaafaru	Senior Technical Officer
17.	Binta Sani Othman	Senior Technical Officer
18.	Olawole Omoluwabi O.	Senior Technical Officer
19.	Hassan Musa	Senior Technical Officer
20.	Abdulsalam Ibrahim Adamu	Senior Technical Officer
21.	Monica Leo	Technologist II
22.	Ayorinde Asala	Higher Work Superintendent
23.	Abubakar Aliyu Sura	Technologist II
24.	Abdul Ndah	Higher Work Superintendent
25.	Usman Abubakar Shehu	Higher Technical Officer
26.	Danladi Waziri	Senior Foreman
27.	Andrew Bako	Senior Technical Officer
28.	Yusuf Abdullahi Babale	Technical Officer
29.	Mikailu Attahiru	Senior Foreman
30.	Amin Tanko Suleiman	Senior Foreman Welder
31.	Isah Mohammed	Chief Tractor Operator

Technical Staff (Junior)

S/No	Name	Rank

1	Philip David	Tractor Driver
2	Babangida Ibrahim	Assistant Technical Officer
3	Abubakar Bello	Assistant Technician
4	Abdullahi Ado	Driver/Mechanic
5	Hamza Rabe	Livestock Attendant
6	Mudi Shehu Isah	Livestock Attendant
7	Adamu Muazu	Assistant Chief Driver
8	Salihu Musa	Assistant Craftman

Library Staff

S/No	Name	Rank
1	Hadiza Abdulkadir	Principal Librarian II
2	Ramatu Haruna	Higher Library Officer

Administrative Staff (Senior)

S/No	Name	Rank
1	Christiana Ekeh	Asst. Chief Confidential Secretary
2	Uduak Stella Udoh	Principal Confidential Secretary
3	Evangeline Onyeago Oleh	Senior Confidential Secretary
4	G. O. Obazelu	Chief Secretarial Assistant
5	Barmani Dan Yaro	Senior Secretarial Assistant II
6	Dwalfa James Nimmyel	Chief Clerical Officer

Administrative Staff (Junior)

S/No	Name	Rank
1	Haruna Abdul	Senior Caretaker
2	Mohammed Tanimu	Senior Caretaker
3	Shittu Halliru	Senior Caretaker
4	Shehu Tanimu	Senior Caretaker

Example of Postharvest Technologies Developed by the Department

Maize Dehusker Sheller – *For dehusking, shelling and cleaning of harvested corncob (maize) in one operation.*

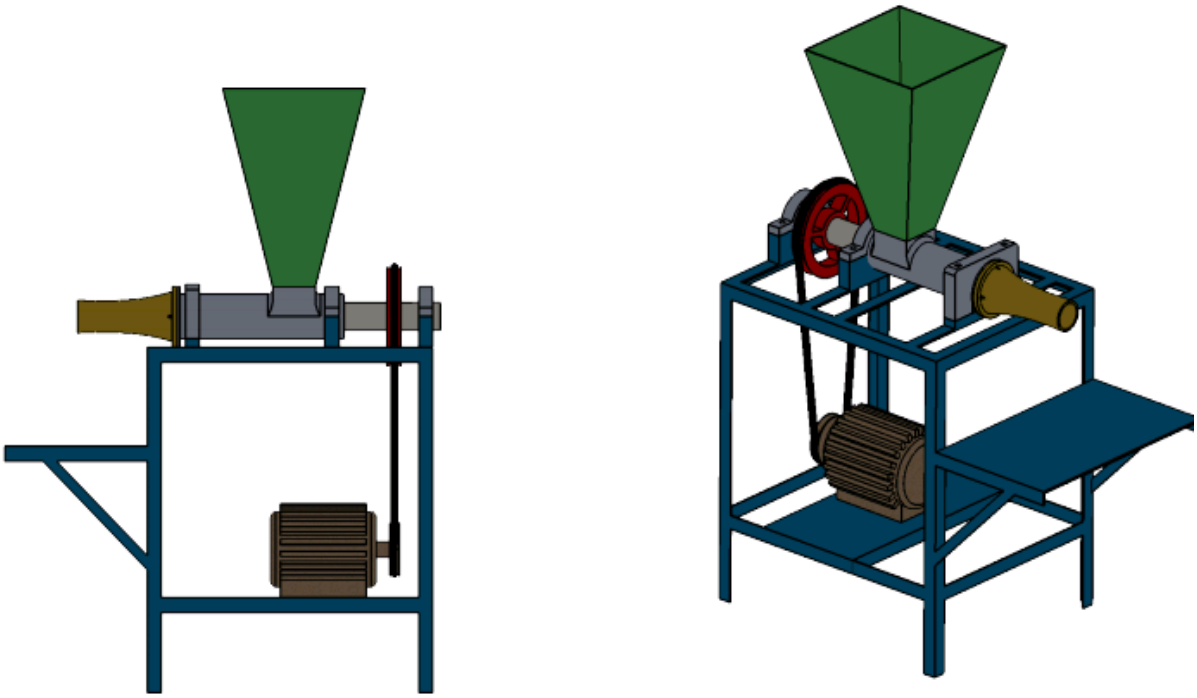
Axil-Flow Multi Crop Thresher – *For threshing of soybean, sorghum and millet.*

Groundnut/Cowpea Sheller -– *For threshing of groundnut and cowpea.*

Forced Convection Electrical Energy Dryer - For drying of vegetable crops

Hand-Pushed Pesticides Applicator – *For Application of Pesticides (Agroc-Chemicals)*

Chicken De-Feathering Machine – *For Removing chicken feather*



Briquetting Machine – *For producing environmental-friendly energy source*