Curriculum

Agricultural and Bioresources Engineering (Food, Seafood and Packaging; Environmental and Waste-to-Energy options)

Faculty of Engineering, Akpakip Oro University (AOU)

Curriculum document: draft for departmental, Faculty and Senate review

Course codes, units and status are provisional until reconciled with the NUC CCMAS

1. Preamble

This curriculum sets out the five-year Bachelor of Engineering programme in Agricultural and Bioresources Engineering (Food, Seafood and Packaging; Environmental and Waste-to-Energy options), offered by the Department of Agricultural and Bioresources Engineering, Faculty of Engineering, Akpakip Oro University (AOU). It is designed to meet the NUC Core Curriculum and Minimum Academic Standards (CCMAS) and the professional requirements for engineering registration in Nigeria.

Course codes, units and compulsory or elective status are provisional and must be reconciled with the official CCMAS before Senate adoption. The CCMAS expansion used here should also be verified against the NUC publication.

2. Aims and Objectives

- Produce agricultural and bioresources engineers who design systems for farming, food, water, waste and bioenergy.
- Offer two options: Food, Seafood and Packaging, and Environmental and Waste-to-Energy.
- Build strong foundations in biology, soil and water science, mechanics and thermo-fluids.
- Prepare graduates for COREN registration and for employment or postgraduate study.

3. Graduate Competencies

On graduation, students should demonstrate competence in the areas below.

Competency	Expected graduate capability
Agricultural engineering science	Apply mechanics, thermo-fluids and numerical methods to farm and bioresource systems.
Soil and water	Manage soil, water, drainage and irrigation for productive and sustainable farming.
Farm power and machinery	Select, test and manage farm power and processing machinery.
Bioresources and biology	Apply biology, microbiology and biochemistry to bioresource systems.
Food science and processing	Design and control food processing operations and food safety systems.
Post-harvest and cold chain	Reduce post-harvest losses and design drying, storage and cold chain systems.
Seafood	Design and manage the processing and quality of fish and seafood products.
Packaging	Select and test packaging materials and design packages for products.
Waste and bioenergy	Design waste management and waste-to-energy systems, including anaerobic digestion.
Environment, sustainability and professional practice	Assess environmental impacts and demonstrate sustainability, safety, ethics and teamwork.

4. Programme Structure

The programme comprises 80 courses and 208 units across ten semesters. The Track column shows whether a course is core (taken by all students) or belongs to a named option.

Track: 'Core' is taken by all students. 'FSP' marks Food, Seafood and Packaging option courses. 'EWE' marks Environmental and Waste-to-Energy option courses.

Year 1: Engineering Foundations

Semester 1 (First semester)

Code	Course	Units	Track
ABE 101	Mathematics I	3	Core
ABE 102	General Physics I	3	Core
ABE 103	General Chemistry I	3	Core

Code	Course	Units	Track
ABE 104	Introductory Engineering	2	Core
ABE 105	Introduction to Computing	2	Core
ABE 106	Communication in English	2	Core
ABE 107	Engineering Laboratory Practicals	1	Core
ABE 108	Introduction to Agricultural and Bioresources Engineering	2	Core
	Semester total	**18**	

Semester 2 (Second semester)

Code	Course	Units	Track
ABE 109	Mathematics II	3	Core
ABE 110	General Physics II	3	Core
ABE 111	General Chemistry II	2	Core
ABE 112	Engineering Drawing and Graphics	2	Core
ABE 113	Programming and Engineering Computation	2	Core
ABE 114	Nigerian Peoples and Cultures	2	Core
ABE 115	Biology for Bioresources	3	Core
ABE 116	Engineering Workshop and Safety	2	Core
	Semester total	**19**	

Year 2: Core Engineering

Semester 3 (First semester)

Code	Course	Units	Track
ABE 201	Engineering Mechanics: Statics	3	Core
ABE 202	Strength of Materials I	3	Core
ABE 203	Engineering Mathematics	3	Core
ABE 204	Fluid Mechanics I	3	Core
ABE 205	Agricultural Soil Science	3	Core
ABE 206	Microbiology for Engineers	3	Core
ABE 207	Biochemistry Fundamentals	2	Core
ABE 208	Agricultural Surveying	2	Core
	Semester total	**22**	

Semester 4 (Second semester)

Code	Course	Units	Track
ABE 209	Engineering Mechanics: Dynamics	3	Core
ABE 210	Thermodynamics I	3	Core
ABE 211	Numerical Methods for Engineers	3	Core
ABE 212	Fluid Mechanics II	3	Core
ABE 213	Heat Transfer	3	Core
ABE 214	Soil and Water Engineering	3	Core
ABE 215	Agricultural Machinery I	3	Core
ABE 216	Agricultural and Bioresources Laboratory I	2	Core
	Semester total	**23**	

Year 3: Specialist Foundations

Semester 5 (First semester)

Code	Course	Units	Track
ABE 301	Agricultural Machinery II	3	Core
ABE 302	Biomass Properties and Characterisation	3	Core
ABE 303	Food Chemistry	3	Core
ABE 304	Food Microbiology	3	Core
ABE 305	Unit Operations for Bioprocessing	3	Core
ABE 306	Irrigation and Drainage Engineering	3	Core
ABE 307	Engineering Statistics and Research Methods	2	Core
ABE 308	Agricultural and Bioresources Laboratory II	2	Core
	Semester total	**22**	

Semester 6 (Second semester)

Code	Course	Units	Track
ABE 309	Food Process Engineering	3	FSP
ABE 310	Post-Harvest Engineering	3	Core
ABE 311	Fish and Seafood Processing Technology	3	FSP
ABE 312	Packaging Materials and Design	3	FSP
ABE 313	Waste Management Fundamentals	3	EWE
ABE 314	Anaerobic Digestion Fundamentals	3	EWE
ABE 315	Engineering Economics	2	Core
ABE 316	Agricultural Structures and Buildings	2	Core
	Semester total	**22**	

Year 4: Advanced Design and Industrial Practice

Semester 7 (First semester)

Code	Course	Units	Track
ABE 401	Food Engineering Operations	3	FSP
ABE 402	Food Preservation and Safety	3	FSP
ABE 403	Seafood Quality and Safety	2	FSP
ABE 404	Packaging Design and Testing	3	FSP
ABE 405	Biogas Technology	3	EWE
ABE 406	Waste-to-Energy Conversion	3	EWE
ABE 407	Environmental Engineering	2	Core
ABE 408	Research Project I	2	Core
	Semester total	**21**	

Semester 8 (Second semester)

Code	Course	Units	Track
ABE 409	Food Product Development	3	FSP
ABE 410	Cold Chain and Refrigeration Engineering	3	FSP
ABE 411	Fish Processing Plant Design	3	FSP

Code	Course	Units	Track
ABE 412	Bioreactor Design and Operation	3	EWE
ABE 413	Composting and Organic Waste Management	2	EWE
ABE 414	Solid Waste Engineering	3	EWE
ABE 415	Climate and Renewable Energy for Agriculture	2	Core
ABE 416	Industrial Training (SIWES)	3	Core
	Semester total	**22**	

Year 5: Specialisation, Integration and Professional Readiness

Semester 9 (First semester)

Code	Course	Units	Track
ABE 501	Advanced Food Process Engineering	3	FSP
ABE 502	Packaging Systems and Sustainability	2	FSP
ABE 503	Advanced Waste-to-Energy Systems	3	EWE
ABE 504	Environmental Impact Assessment	2	EWE
ABE 505	Water Quality and Treatment	3	Core
ABE 506	Research Project II	3	Core
ABE 507	Agricultural Systems Management	2	Core
ABE 508	Technical Elective I	2	Core
	Semester total	**20**	

Semester 10 (Second semester)

Code	Course	Units	Track
ABE 509	Integrated Bioresources System Design	3	Core
ABE 510	Food Plant Design and Layout	2	FSP
ABE 511	Landfill and Waste Facility Design	2	EWE
ABE 512	Engineering Professional Practice and Ethics	2	Core
ABE 513	Sustainable Agriculture and Food Systems	2	Core
ABE 514	Risk and Safety in Agro-processing	2	Core
ABE 515	Final-Year Design Project and Defence	4	Core
ABE 516	Technical Elective II	2	Core
	Semester total	**19**	

Units by year

Year	Level	Units
Year 1	100	37
Year 2	200	45
Year 3	300	44
Year 4	400	43
Year 5	500	39
Total		208

5. Option Emphasis

Students choose one of two options in Year 3, Semester 6. The Food, Seafood and Packaging (FSP) option covers food process engineering and operations, food preservation and safety, seafood processing and quality, packaging materials and testing, food product development, cold chain and refrigeration, fish processing plant design, and food plant layout. The Environmental and Waste-to-Energy (EWE) option covers waste management, anaerobic digestion, biogas technology, waste-to-energy conversion, bioreactor design, composting, solid waste and landfill engineering, and environmental impact assessment. Core courses in soil and water, farm machinery, biology, post-harvest engineering, water and sustainability are common to all students.

6. Assessment Framework

The department uses a balanced assessment system. Exact weightings must be approved under the university's academic regulations and applicable programme standards.

Assessment method	Purpose
Written examinations	Test conceptual understanding and engineering analysis.
Assignments and problem sets	Assess calculations, design reasoning and independent learning.
Laboratory reports	Assess experimental method, data analysis and technical reporting.
Design projects	Assess engineering judgement, calculations, drawings and specifications.
Presentations and defences	Assess communication, teamwork and justification of technical decisions.
Industrial training	Assess workplace competence, professional conduct and practical experience.
Final-year project	Assess independent investigation and integrated engineering design.

7. Industrial Training and Projects

- **SIWES (Semester 8, 3 units):** supervised industrial attachment, assessed by logbook, report and assessor.
- **Research Project I and II (Semesters 7 and 9):** proposal, then execution and reporting.
- **Final-Year Design Project and Defence (Semester 10, 4 units):** integrated design with a formal defence.

8. Resource Requirements for Accreditation

The resource-verification file should document actual facilities, staff, maintenance and funding, not only proposed equipment.

- **Soil and water laboratory:** soil physics, infiltration and water quality test equipment.
- **Machinery workshop and test rig:** tractors, implements and a power test facility.
- **Food processing pilot plant:** dryers, mixers, heat exchangers and packaging equipment.
- **Food microbiology laboratory:** incubators, autoclave, microscopes and biosafety cabinet.
- **Waste and bioenergy facility:** anaerobic digesters, biogas measurement, and a composting site.
- **Field station:** farm plots and irrigation demonstration areas for field work.
- **Human resources:** qualified academic staff and technical staff with appropriate specialisms.
- **Library:** current textbooks, standards, technical journals and digital reference access.
- **Digital facilities:** software licences and computing infrastructure appropriate to the programme.
- **Industry partnerships:** employers, professional bodies and placement providers for SIWES.

9. Quality Assurance and CCMAS Alignment

- Map each course to the relevant NUC CCMAS course and learning outcomes.
- Verify course numbering, credit units, contact hours and prerequisites.
- Confirm the allocation of core and university-designed courses under the applicable CCMAS framework.

- Check professional requirements with COREN and other relevant accreditation bodies.
- Establish a curriculum review committee and an external academic review process.
- Submit the programme through the university's governance and regulatory approval processes.

10. Companion Documents

This curriculum is accompanied by the Students' Handbook, with full course specifications, and the Lecturers' Handbook, with teaching schemes, lab instructions, rubrics and assessment design.