Students' Handbook

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

Faculty of Engineering, Akpakip Oro University (AOU)

Academic year: [to be inserted]

Draft for Faculty approval

1. Welcome

Welcome to the Department of Agricultural and Bioresources Engineering. This handbook explains the Agricultural and Bioresources Engineering (Food, Seafood and Packaging; Environmental and Waste-to-Energy options) programme: what you will study, how you will be assessed, and where to get help. Read it alongside the university's academic regulations, which take precedence where they differ.

2. About the Programme

The programme trains engineers who design the systems that produce, process, package and manage the resources that feed people and power communities. Years 1 and 2 build foundations in biology, mathematics, mechanics and soil and water science. Years 3 to 5 add the option specialisation, culminating in an integrated design project and defence.

Graduate profile

- Design farm, water and bioresource systems to applicable standards.
- Design food and seafood processing and packaging systems that are safe and efficient.
- Design waste management and bioenergy systems that protect the environment.
- Assess environmental impacts and promote sustainable agriculture and food systems.
- Work ethically and communicate effectively with farmers, communities and industry.

Career pathways

Graduates may work in food and beverage processing, seafood processors, packaging companies, agro-allied industries, waste management and environmental agencies, bioenergy developers, irrigation and water agencies, and agricultural development programmes. Graduates who register with COREN may practise as professional engineers in Nigeria. Postgraduate study is also an option.

Professional registration

Registration with the Council for the Regulation of Engineering in Nigeria (COREN) requires an accredited qualification and professional experience. Keep your SIWES records and project reports, as they support your later registration.

3. Programme Structure

The tables list every course, its units, the semester in which it is taken, and its track. Codes and units are provisional until confirmed in the approved CCMAS schedule.

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
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

Code	Course	Units	Track
	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

Code	Course	Units	Track
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
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

Code	Course	Units	Track
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**	

4. Course Specifications

Each entry gives the course description, learning outcomes, topics, assessment and recommended texts. Your lecturer issues the week-by-week scheme for each course.

Year 1: Engineering Foundations

ABE 101 Mathematics I

Units: 3 | Year 1, Semester 1 (First semester)

Description. Algebra, calculus and coordinate geometry for engineering.

Learning outcomes:

- Solve algebraic and trigonometric problems
- Apply differentiation to engineering rates

Course topics:

1. Functions and graphs
2. Differentiation
3. Integration
4. Applications

Assessment: CA 30 / Exam 70

Recommended texts: Stroud and Booth (latest edition)

ABE 102 General Physics I

Units: 3 | Year 1, Semester 1 (First semester)

Description. Mechanics, waves and thermal physics for engineers.

Learning outcomes:

- Analyse forces, motion and energy
- Apply conservation laws

Course topics:

1. Kinematics and dynamics
2. Work and energy
3. Rotation
4. Oscillations

Assessment: CA 30 / Exam 70

Recommended texts: Halliday, Resnick and Walker (latest edition)

ABE 103 General Chemistry I

Units: 3 | Year 1, Semester 1 (First semester)

Description. Atomic structure, bonding and stoichiometry for bioresources.

Learning outcomes:

- Explain atomic structure and bonding
- Perform stoichiometric calculations

Course topics:

1. Atomic structure
2. Bonding
3. Stoichiometry
4. Solutions

Assessment: CA 30 / Exam 70

Recommended texts: Chang and Goldsby (latest edition)

ABE 104 Introductory Engineering

Units: 2 | Year 1, Semester 1 (First semester)

Description. Overview of engineering disciplines, problem solving and professional ethics.

Learning outcomes:

- Describe engineering disciplines
- Apply a structured problem-solving method

Course topics:

1. Disciplines and roles
2. Units
3. Problem solving
4. Professional ethics

Assessment: CA 50 / Exam 50

Recommended texts: Dym and Little (latest edition)

ABE 105 Introduction to Computing

Units: 2 | Year 1, Semester 1 (First semester)

Description. Computer fundamentals and productivity tools.

Learning outcomes:

- Use common computing tools
- Explain computer system components

Course topics:

1. Hardware
2. Operating systems
3. Productivity tools
4. Data management

Assessment: CA 60 / Exam 40

Recommended texts: Shelly and Vermaat (latest edition)

ABE 106 Communication in English

Units: 2 | Year 1, Semester 1 (First semester)

Description. Academic and technical writing and presentation.

Learning outcomes:

- Write clear technical reports
- Deliver structured presentations

Course topics:

1. Academic writing
2. Technical reports
3. Presentations
4. Listening

Assessment: CA 60 / Exam 40

Recommended texts: Swales and Feak (latest edition)

ABE 107 Engineering Laboratory Practicals

Units: 1 | Year 1, Semester 1 (First semester)

Description. Introductory measurement, error analysis and laboratory safety.

Learning outcomes:

- Record and analyse measurement data
- Apply laboratory safety procedures

Course topics:

1. Units and measurement
2. Error analysis
3. Data presentation
4. Laboratory safety

Assessment: Lab reports 100

Recommended texts: Institutional laboratory manual

ABE 108 Introduction to Agricultural and Bioresources Engineering

Units: 2 | Year 1, Semester 1 (First semester)

Description. Scope of the discipline across farming, food, water, environment and bioenergy.

Learning outcomes:

- Describe the discipline's subfields
- Discuss agricultural and bioresources careers

Course topics:

1. Farm systems
2. Food systems
3. Water and environment
4. Bioenergy

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 109 Mathematics II

Units: 3 | Year 1, Semester 2 (Second semester)

Description. Matrices, series, vectors and differential equations.

Learning outcomes:

- Solve linear systems
- Solve first and second order differential equations

Course topics:

1. Matrices
2. Vectors
3. Series
4. Differential equations

Assessment: CA 30 / Exam 70

Recommended texts: Stroud and Booth (latest edition)

ABE 110 General Physics II

Units: 3 | Year 1, Semester 2 (Second semester)

Description. Electricity, magnetism, optics and modern physics.

Learning outcomes:

- Analyse electric and magnetic fields
- Apply optics and modern physics concepts

Course topics:

1. Electrostatics
2. Magnetism
3. Optics
4. Modern physics

Assessment: CA 30 / Exam 70

Recommended texts: Halliday, Resnick and Walker (latest edition)

ABE 111 General Chemistry II

Units: 2 | Year 1, Semester 2 (Second semester)

Description. Thermochemistry, kinetics, equilibrium and electrochemistry.

Learning outcomes:

- Apply thermochemical and kinetic principles
- Explain chemical equilibrium

Course topics:

1. Thermochemistry
2. Kinetics
3. Equilibrium
4. Electrochemistry

Assessment: CA 30 / Exam 70

Recommended texts: Chang and Goldsby (latest edition)

ABE 112 Engineering Drawing and Graphics

Units: 2 | Year 1, Semester 2 (Second semester)

Description. Orthographic projection and drawings of farm structures and equipment.

Learning outcomes:

- Produce orthographic drawings
- Read machine and structure drawings

Course topics:

1. Orthographic projection
2. Sections
3. Dimensioning
4. Structure drawings

Assessment: Coursework 60 / Exam 40

Recommended texts: Giesecke et al., Technical Drawing (latest edition)

ABE 113 Programming and Engineering Computation

Units: 2 | Year 1, Semester 2 (Second semester)

Description. Structured programming and numerical methods.

Learning outcomes:

- Write structured programs for engineering problems
- Apply numerical methods

Course topics:

1. Programming basics
2. Control structures
3. Functions
4. Numerical methods

Assessment: CA 50 / Exam 50

Recommended texts: Chapra (latest edition)

ABE 114 Nigerian Peoples and Cultures

Units: 2 | Year 1, Semester 2 (Second semester)

Description. Nigerian history, cultures and national development, or applicable general studies as prescribed.

Learning outcomes:

- Describe Nigerian cultural diversity
- Discuss national development issues

Course topics:

1. Nigerian history
2. Cultural diversity
3. Governance
4. Contemporary issues

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 115 Biology for Bioresources

Units: 3 | Year 1, Semester 2 (Second semester)

Description. Cell biology, plant and animal biology relevant to bioresources.

Learning outcomes:

- Describe cell and organism biology
- Explain plant and animal systems relevant to production

Course topics:

1. Cell biology
2. Plant biology
3. Animal biology
4. Ecology

Assessment: CA 30 / Exam 70

Recommended texts: Campbell and Reece, Biology (latest edition)

ABE 116 Engineering Workshop and Safety

Units: 2 | Year 1, Semester 2 (Second semester)

Description. Workshop practice, hand and power tools and farm machine safety.

Learning outcomes:

- Use common tools safely
- Apply workshop and machine safety standards

Course topics:

1. Workshop safety
2. Hand tools
3. Power tools
4. Machine safety

Assessment: Practical 70 / Exam 30

Recommended texts: Institutional workshop manual

Year 2: Core Engineering

ABE 201 Engineering Mechanics: Statics

Units: 3 | Year 2, Semester 3 (First semester)

Description. Equilibrium of particles and rigid bodies.

Learning outcomes:

- Analyse equilibrium of rigid bodies
- Determine forces in frames

Course topics:

1. Force systems
2. Equilibrium
3. Trusses
4. Friction

Assessment: CA 30 / Exam 70

Recommended texts: Hibbeler (latest edition)

ABE 202 Strength of Materials I

Units: 3 | Year 2, Semester 3 (First semester)

Description. Stress, strain and deformation of members.

Learning outcomes:

- Calculate stresses and strains
- Analyse bending and shear

Course topics:

1. Stress and strain
2. Axial loading
3. Torsion
4. Bending and shear

Assessment: CA 30 / Exam 70

Recommended texts: Gere and Goodno (latest edition)

ABE 203 Engineering Mathematics

Units: 3 | Year 2, Semester 3 (First semester)

Description. Partial derivatives, multiple integrals and Laplace transforms.

Learning outcomes:

- Apply Laplace transforms
- Solve partial differential problems

Course topics:

1. Partial derivatives
2. Multiple integrals
3. Laplace transforms
4. Fourier series

Assessment: CA 30 / Exam 70

Recommended texts: Kreyszig (latest edition)

ABE 204 Fluid Mechanics I

Units: 3 | Year 2, Semester 3 (First semester)

Description. Fluid properties, hydrostatics and conservation principles.

Learning outcomes:

- Calculate hydrostatic forces
- Apply continuity and Bernoulli principles

Course topics:

1. Fluid properties
2. Hydrostatics
3. Continuity
4. Bernoulli equation

Assessment: CA 30 / Exam 70

Recommended texts: Streeter, Wylie and Bedford (latest edition)

ABE 205 Agricultural Soil Science

Units: 3 | Year 2, Semester 3 (First semester)

Description. Soil formation, fertility and physical properties.

Learning outcomes:

- Describe soil formation and fertility
- Measure soil physical properties

Course topics:

1. Soil formation
2. Fertility
3. Physical properties
4. Soil classification

Assessment: CA 30 / Exam 70

Recommended texts: Brady and Weil, The Nature and Properties of Soils (latest edition)

ABE 206 Microbiology for Engineers

Units: 3 | Year 2, Semester 3 (First semester)

Description. Microorganisms in food, water, waste and bioenergy.

Learning outcomes:

- Describe microbial groups and growth
- Apply microbiological control

Course topics:

1. Microbial groups
2. Growth
3. Control
4. Biotechnology basics

Assessment: CA 40 / Exam 60

Recommended texts: Madigan et al., Brock Biology of Microorganisms (latest edition)

ABE 207 Biochemistry Fundamentals

Units: 2 | Year 2, Semester 3 (First semester)

Description. Biomolecules and metabolism relevant to food and bioenergy.

Learning outcomes:

- Describe major biomolecules
- Explain metabolic pathways

Course topics:

1. Carbohydrates
2. Proteins
3. Lipids
4. Metabolism

Assessment: CA 40 / Exam 60

Recommended texts: Nelson and Cox, Lehninger Principles of Biochemistry (latest edition)

ABE 208 Agricultural Surveying

Units: 2 | Year 2, Semester 3 (First semester)

Description. Surveying for farm layout, drainage and irrigation.

Learning outcomes:

- Perform basic surveys for farm layout
- Set out drainage and irrigation features

Course topics:

1. Measurement
2. Levelling
3. Layout
4. Setting out

Assessment: Practical 60 / Exam 40

Recommended texts: Kavanagh (latest edition)

ABE 209 Engineering Mechanics: Dynamics

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Kinematics and kinetics of particles and rigid bodies.

Learning outcomes:

- Analyse motion of rigid bodies
- Apply work-energy and impulse-momentum

Course topics:

1. Kinematics
2. Kinetics
3. Work and energy
4. Impulse and momentum

Assessment: CA 30 / Exam 70

Recommended texts: Meriam and Kraige (latest edition)

ABE 210 Thermodynamics I

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Energy, work and heat for agricultural and food systems.

Learning outcomes:

- Apply the first law
- Apply the second law

Course topics:

1. First law
2. Second law
3. Properties
4. Cycles

Assessment: CA 30 / Exam 70

Recommended texts: Cengel and Boles (latest edition)

ABE 211 Numerical Methods for Engineers

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Numerical solution of engineering equations.

Learning outcomes:

- Apply numerical root finding and interpolation
- Solve ODEs numerically

Course topics:

1. Root finding
2. Interpolation
3. Numerical integration
4. ODE solvers

Assessment: CA 40 / Exam 60

Recommended texts: Chapra (latest edition)

ABE 212 Fluid Mechanics II

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Pipe flow, open channel flow and pump selection.

Learning outcomes:

- Design pipe systems
- Select pumps for irrigation

Course topics:

1. Pipe flow
2. Head losses
3. Open channels
4. Pumps

Assessment: CA 30 / Exam 70

Recommended texts: Streeter, Wylie and Bedford (latest edition)

ABE 213 Heat Transfer

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Conduction, convection and radiation in agricultural and food systems.

Learning outcomes:

- Calculate conduction and convection
- Assess heat loads on structures and products

Course topics:

1. Conduction
2. Convection
3. Radiation
4. Heat loads

Assessment: CA 30 / Exam 70

Recommended texts: Incropera et al. (latest edition)

ABE 214 Soil and Water Engineering

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Infiltration, drainage and soil water management.

Learning outcomes:

- Measure infiltration
- Design simple drainage systems

Course topics:

1. Infiltration
2. Drainage
3. Soil water
4. Erosion control

Assessment: CA 30 / Exam 70

Recommended texts: Schwab et al., Soil and Water Conservation Engineering (latest edition)

ABE 215 Agricultural Machinery I

Units: 3 | Year 2, Semester 4 (Second semester)

Description. Tractors, power transmission and tillage machinery.

Learning outcomes:

- Describe tractor systems
- Select tillage machinery

Course topics:

1. Tractors
2. Power transmission
3. Tillage
4. Implement matching

Assessment: CA 30 / Exam 70

Recommended texts: Srivastava et al., Engineering Principles of Agricultural Machines (latest edition)

ABE 216 Agricultural and Bioresources Laboratory I

Units: 2 | Year 2, Semester 4 (Second semester)

Description. Soil, water and machinery experiments.

Learning outcomes:

- Carry out soil and water tests
- Write laboratory reports

Course topics:

1. Soil tests
2. Water tests
3. Machinery tests
4. Reporting

Assessment: Lab reports 100

Recommended texts: Institutional laboratory manual

Year 3: Specialist Foundations

ABE 301 Agricultural Machinery II

Units: 3 | Year 3, Semester 5 (First semester)

Description. Harvesting, processing and crop handling machinery.

Learning outcomes:

- Analyse harvesting machinery
- Select processing machinery

Course topics:

1. Harvesters
2. Threshers
3. Crop handling
4. Machinery selection

Assessment: CA 30 / Exam 70

Recommended texts: Srivastava et al. (latest edition)

ABE 302 Biomass Properties and Characterisation

Units: 3 | Year 3, Semester 5 (First semester)

Description. Physical and chemical properties of biomass for conversion.

Learning outcomes:

- Characterise biomass properties
- Select biomass for conversion

Course topics:

1. Proximate analysis
2. Ultimate analysis
3. Calorific value
4. Physical properties

Assessment: CA 30 / Exam 70

Recommended texts: Basu, Biomass Gasification and Pyrolysis (latest edition)

ABE 303 Food Chemistry

Units: 3 | Year 3, Semester 5 (First semester)

Description. Chemistry of food components and changes during processing.

Learning outcomes:

- Explain food component chemistry
- Predict changes during processing

Course topics:

1. Water activity
2. Proteins
3. Lipids
4. Processing reactions

Assessment: CA 30 / Exam 70

Recommended texts: Belitz, Grosch and Schieberle, Food Chemistry (latest edition)

ABE 304 Food Microbiology

Units: 3 | Year 3, Semester 5 (First semester)

Description. Microbial spoilage, pathogens and control in food.

Learning outcomes:

- Identify spoilage and pathogenic organisms
- Apply microbial control methods

Course topics:

1. Spoilage
2. Pathogens
3. Control methods
4. Food safety

Assessment: CA 40 / Exam 60

Recommended texts: Jay, Loessner and Golden, Modern Food Microbiology (latest edition)

ABE 305 Unit Operations for Bioprocessing

Units: 3 | Year 3, Semester 5 (First semester)

Description. Mass and heat transfer operations in bioprocessing.

Learning outcomes:

- Apply mass transfer operations
- Apply heat transfer operations

Course topics:

1. Drying
2. Evaporation
3. Distillation basics
4. Membranes

Assessment: CA 30 / Exam 70

Recommended texts: Geankoplis (latest edition)

ABE 306 Irrigation and Drainage Engineering

Units: 3 | Year 3, Semester 5 (First semester)

Description. Irrigation systems design and drainage.

Learning outcomes:

- Design irrigation systems
- Design drainage systems

Course topics:

1. Water requirements
2. Irrigation methods
3. Drainage
4. System design

Assessment: CA 30 / Exam 70

Recommended texts: Michael, Irrigation: Theory and Practice (latest edition)

ABE 307 Engineering Statistics and Research Methods

Units: 2 | Year 3, Semester 5 (First semester)

Description. Statistics and research design for agriculture and bioresources.

Learning outcomes:

- Apply descriptive and inferential statistics
- Design simple experiments

Course topics:

1. Descriptive statistics
2. Probability
3. Hypothesis testing
4. Research design

Assessment: CA 40 / Exam 60

Recommended texts: Montgomery and Runger (latest edition)

ABE 308 Agricultural and Bioresources Laboratory II

Units: 2 | Year 3, Semester 5 (First semester)

Description. Biomass, food and microbiology experiments.

Learning outcomes:

- Carry out biomass and food tests
- Write laboratory reports

Course topics:

1. Biomass tests
2. Food tests
3. Microbiology tests
4. Reporting

Assessment: Lab reports 100

Recommended texts: Institutional laboratory manual

ABE 309 Food Process Engineering

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Engineering of food processing operations.

Learning outcomes:

- Analyse food process operations
- Design simple food processes

Course topics:

1. Thermal processing
2. Drying
3. Extrusion
4. Process design

Assessment: CA 30 / Exam 70

Recommended texts: Fellows, Food Processing Technology (latest edition)

ABE 310 Post-Harvest Engineering

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Harvesting losses, drying, storage and handling of crops.

Learning outcomes:

- Quantify post-harvest losses
- Design drying and storage systems

Course topics:

1. Losses
2. Drying
3. Storage
4. Handling

Assessment: CA 30 / Exam 70

Recommended texts: Chakraverty, Post Harvest Technology of Cereals (latest edition)

ABE 311 Fish and Seafood Processing Technology

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Processing technology for fish and seafood products.

Learning outcomes:

- Describe fish processing methods
- Specify seafood processing lines

Course topics:

1. Fish handling
2. Smoking
3. Drying
4. Canning and freezing

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

ABE 312 Packaging Materials and Design

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Packaging materials and package design.

Learning outcomes:

- Select packaging materials
- Design packages for products

Course topics:

1. Materials
2. Barrier properties
3. Package design
4. Labelling

Assessment: CA 30 / Exam 70

Recommended texts: Robertson, Food Packaging (latest edition)

ABE 313 Waste Management Fundamentals

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Sources, characterisation and management of agricultural and municipal waste.

Learning outcomes:

- Characterise waste streams
- Plan waste management systems

Course topics:

1. Waste sources
2. Characterisation
3. Collection
4. Management systems

Assessment: CA 30 / Exam 70

Recommended texts: Tchobanoglous, Theisen and Vigil, Integrated Solid Waste Management (latest edition)

ABE 314 Anaerobic Digestion Fundamentals

Units: 3 | Year 3, Semester 6 (Second semester)

Description. Biochemistry and engineering of anaerobic digestion.

Learning outcomes:

- Describe anaerobic digestion stages
- Calculate digester performance

Course topics:

1. Hydrolysis
2. Acidogenesis
3. Methanogenesis
4. Digester design basics

Assessment: CA 30 / Exam 70

Recommended texts: Appels et al., Anaerobic Digestion (latest edition)

ABE 315 Engineering Economics

Units: 2 | Year 3, Semester 6 (Second semester)

Description. Economic evaluation of engineering projects.

Learning outcomes:

- Evaluate project cash flows
- Compare investment options

Course topics:

1. Time value of money
2. Cash flow
3. Depreciation
4. Appraisal

Assessment: CA 40 / Exam 60

Recommended texts: Blank and Tarquin (latest edition)

ABE 316 Agricultural Structures and Buildings

Units: 2 | Year 3, Semester 6 (Second semester)

Description. Design of farm buildings, stores and animal housing.

Learning outcomes:

- Design simple farm structures
- Specify ventilation for stores

Course topics:

1. Loads
2. Structures
3. Ventilation
4. Storage design

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

Year 4: Advanced Design and Industrial Practice

ABE 401 Food Engineering Operations

Units: 3 | Year 4, Semester 7 (First semester)

Description. Operations in food processing plants.

Learning outcomes:

- Operate food processing units
- Analyse process performance

Course topics:

1. Operations
2. Process performance
3. Hygiene
4. Automation

Assessment: CA 30 / Exam 70

Recommended texts: Fellows (latest edition)

ABE 402 Food Preservation and Safety

Units: 3 | Year 4, Semester 7 (First semester)

Description. Preservation methods and food safety systems.

Learning outcomes:

- Select preservation methods
- Apply food safety systems

Course topics:

1. Thermal preservation
2. Chilling and freezing
3. Preservatives
4. HACCP

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

ABE 403 Seafood Quality and Safety

Units: 2 | Year 4, Semester 7 (First semester)

Description. Quality and safety of fish and seafood.

Learning outcomes:

- Assess seafood quality
- Apply seafood safety controls

Course topics:

1. Quality indicators
2. Spoilage
3. Hazards
4. Controls

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 404 Packaging Design and Testing

Units: 3 | Year 4, Semester 7 (First semester)

Description. Testing of packages and packaging performance.

Learning outcomes:

- Test packaging performance
- Evaluate shelf-life effects

Course topics:

1. Mechanical tests
2. Barrier tests
3. Shelf life
4. Standards

Assessment: CA 30 / Exam 70

Recommended texts: Robertson (latest edition)

ABE 405 Biogas Technology

Units: 3 | Year 4, Semester 7 (First semester)

Description. Design and operation of biogas systems.

Learning outcomes:

- Design biogas plants
- Assess biogas quality and yield

Course topics:

1. Plant design
2. Biogas quality
3. Yield
4. Operation

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

ABE 406 Waste-to-Energy Conversion

Units: 3 | Year 4, Semester 7 (First semester)

Description. Thermochemical and biological waste-to-energy routes.

Learning outcomes:

- Compare waste-to-energy routes
- Assess energy recovery

Course topics:

1. Combustion
2. Gasification
3. Pyrolysis
4. Energy recovery

Assessment: CA 30 / Exam 70

Recommended texts: Basu (latest edition)

ABE 407 Environmental Engineering

Units: 2 | Year 4, Semester 7 (First semester)

Description. Air, water and waste management in agricultural and food systems.

Learning outcomes:

- Assess emissions and effluents
- Describe treatment options

Course topics:

1. Emissions
2. Effluent treatment
3. Waste management
4. Regulations

Assessment: CA 40 / Exam 60

Recommended texts: Davis and Cornwell (latest edition)

ABE 408 Research Project I

Units: 2 | Year 4, Semester 7 (First semester)

Description. Literature review and proposal for the final-year project.

Learning outcomes:

- Conduct a literature review
- Write a research proposal

Course topics:

1. Literature search
2. Research questions
3. Methodology
4. Proposal writing

Assessment: Proposal 100

Recommended texts: Supervisor guidance and departmental guide

ABE 409 Food Product Development

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Development and scale-up of new food products.

Learning outcomes:

- Develop food product formulations
- Scale up product processes

Course topics:

1. Formulation
2. Sensory evaluation
3. Scale-up
4. Shelf life

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

ABE 410 Cold Chain and Refrigeration Engineering

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Refrigeration and cold chain design for perishables.

Learning outcomes:

- Design cold stores
- Plan cold chain logistics

Course topics:

1. Refrigeration cycles
2. Cold store design
3. Logistics
4. Monitoring

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

ABE 411 Fish Processing Plant Design

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Design of fish and seafood processing plants.

Learning outcomes:

- Lay out processing plants
- Specify plant utilities

Course topics:

1. Layout
2. Utilities
3. Hygiene design
4. Effluent handling

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

ABE 412 Bioreactor Design and Operation

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Design and operation of bioreactors for waste and bioenergy.

Learning outcomes:

- Design bioreactors
- Operate bioreactors safely

Course topics:

1. Reactor types
2. Mixing
3. Monitoring
4. Operation

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

ABE 413 Composting and Organic Waste Management

Units: 2 | Year 4, Semester 8 (Second semester)

Description. Composting systems and organic waste management.

Learning outcomes:

- Design composting systems
- Manage compost quality

Course topics:

1. Composting process
2. Systems
3. Quality
4. Application

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 414 Solid Waste Engineering

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Solid waste collection, processing and disposal.

Learning outcomes:

- Design collection systems
- Assess disposal options

Course topics:

1. Collection
2. Transfer
3. Processing
4. Disposal

Assessment: CA 30 / Exam 70

Recommended texts: Tchobanoglous et al. (latest edition)

ABE 415 Climate and Renewable Energy for Agriculture

Units: 2 | Year 4, Semester 8 (Second semester)

Description. Climate, energy and renewable systems for farms.

Learning outcomes:

- Assess climate effects on farms
- Select renewable energy for farm use

Course topics:

1. Climate
2. Solar and wind for farms
3. Energy use
4. Adaptation

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 416 Industrial Training (SIWES)

Units: 3 | Year 4, Semester 8 (Second semester)

Description. Supervised industrial attachment in a relevant organisation.

Learning outcomes:

- Apply engineering knowledge in practice
- Keep a professional logbook

Course topics:

1. Workplace induction
2. Practical tasks
3. Reporting
4. Professional conduct

Assessment: Logbook 40 / Report 40 / Assessor 20

Recommended texts: SIWES guidelines issued by the Industrial Training Fund and AOU

Year 5: Specialisation, Integration and Professional Readiness

ABE 501 Advanced Food Process Engineering

Units: 3 | Year 5, Semester 9 (First semester)

Description. Advanced process design and optimisation for food operations.

Learning outcomes:

- Optimise food processes
- Evaluate process alternatives

Course topics:

1. Optimisation
2. Process alternatives
3. Energy use
4. Quality

Assessment: CA 30 / Exam 70

Recommended texts: Departmental reading list, to be confirmed

ABE 502 Packaging Systems and Sustainability

Units: 2 | Year 5, Semester 9 (First semester)

Description. Packaging systems, recycling and lifecycle assessment.

Learning outcomes:

- Assess packaging lifecycles
- Design sustainable packaging systems

Course topics:

1. Lifecycle assessment
2. Recycling
3. Materials
4. Design

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 503 Advanced Waste-to-Energy Systems

Units: 3 | Year 5, Semester 9 (First semester)

Description. Integrated waste-to-energy systems and their performance.

Learning outcomes:

- Evaluate integrated systems
- Assess system performance

Course topics:

1. Integrated systems
2. Performance
3. Emissions control
4. Economics

Assessment: CA 30 / Exam 70

Recommended texts: Basu (latest edition)

ABE 504 Environmental Impact Assessment

Units: 2 | Year 5, Semester 9 (First semester)

Description. Environmental assessment procedures for projects.

Learning outcomes:

- Prepare impact assessments
- Assess mitigation measures

Course topics:

1. Screening
2. Baseline
3. Impacts
4. Mitigation

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 505 Water Quality and Treatment

Units: 3 | Year 5, Semester 9 (First semester)

Description. Water quality parameters and treatment processes.

Learning outcomes:

- Interpret water quality data
- Select treatment processes

Course topics:

1. Quality parameters
2. Treatment processes
3. Standards
4. Monitoring

Assessment: CA 30 / Exam 70

Recommended texts: Davis and Cornwell (latest edition)

ABE 506 Research Project II

Units: 3 | Year 5, Semester 9 (First semester)

Description. Execution, analysis and reporting of the final-year project.

Learning outcomes:

- Execute a research project
- Report findings professionally

Course topics:

1. Data collection
2. Analysis
3. Writing
4. Oral presentation

Assessment: Project 100

Recommended texts: Supervisor guidance and departmental guide

ABE 507 Agricultural Systems Management

Units: 2 | Year 5, Semester 9 (First semester)

Description. Management of farm and agro-industrial systems.

Learning outcomes:

- Plan farm systems
- Manage agro-industrial operations

Course topics:

1. Farm systems
2. Operations
3. Scheduling
4. Performance

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 508 Technical Elective I

Units: 2 | Year 5, Semester 9 (First semester)

Description. Elective from the approved agricultural and bioresources list.

Learning outcomes:

- Apply specialist knowledge in the chosen area
- Evaluate case studies

Course topics:

1. Selected topic
2. Case studies
3. Applications
4. Review

Assessment: CA 40 / Exam 60

Recommended texts: As specified for the chosen elective

ABE 509 Integrated Bioresources System Design

Units: 3 | Year 5, Semester 10 (Second semester)

Description. Capstone design of an integrated agricultural or bioresources system.

Learning outcomes:

- Integrate system elements
- Produce a coordinated design

Course topics:

1. System integration
2. Design documentation
3. Testing
4. Review

Assessment: Design project 100

Recommended texts: Departmental design brief

ABE 510 Food Plant Design and Layout

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Layout and design of food processing plants.

Learning outcomes:

- Lay out food plants
- Specify plant services

Course topics:

1. Layout
2. Hygiene
3. Services
4. Flow of materials

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 511 Landfill and Waste Facility Design

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Design of landfills and waste facilities.

Learning outcomes:

- Design landfill cells
- Specify leachate and gas control

Course topics:

1. Cell design
2. Liners
3. Leachate
4. Gas control

Assessment: CA 40 / Exam 60

Recommended texts: Tchobanoglous et al. (latest edition)

ABE 512 Engineering Professional Practice and Ethics

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Professional conduct, registration and engineering law.

Learning outcomes:

- Apply professional ethics
- Describe registration and legal responsibilities

Course topics:

1. Ethics
2. Professional bodies
3. Registration
4. Engineering law

Assessment: CA 50 / Exam 50

Recommended texts: Departmental reading list, to be confirmed

ABE 513 Sustainable Agriculture and Food Systems

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Sustainability of food and agricultural systems.

Learning outcomes:

- Assess sustainability of food systems
- Apply sustainable practice

Course topics:

1. Food systems
2. Sustainability
3. Resource efficiency
4. Policy

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 514 Risk and Safety in Agro-processing

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Hazard analysis and safety in agro-processing and waste facilities.

Learning outcomes:

- Conduct hazard analysis
- Develop safety procedures

Course topics:

1. Hazards
2. Dust and gas risks
3. Biological risks
4. Safety procedures

Assessment: CA 40 / Exam 60

Recommended texts: Departmental reading list, to be confirmed

ABE 515 Final-Year Design Project and Defence

Units: 4 | Year 5, Semester 10 (Second semester)

Description. Culminating integrated design project with defence.

Learning outcomes:

- Produce a complete design project
- Defend design decisions orally

Course topics:

1. Design development
2. Documentation
3. Presentation
4. Defence

Assessment: Project 60 / Defence 40

Recommended texts: Departmental project guide

ABE 516 Technical Elective II

Units: 2 | Year 5, Semester 10 (Second semester)

Description. Second elective from the approved agricultural and bioresources list.

Learning outcomes:

- Apply specialist knowledge in the chosen area
- Evaluate case studies

Course topics:

1. Selected topic
2. Case studies
3. Applications
4. Review

Assessment: CA 40 / Exam 60

Recommended texts: As specified for the chosen elective

5. Industrial Training (SIWES)

- SIWES is taken in Year 4, Semester 8, for 3 units.
- Keep a daily or weekly logbook that records tasks, supervision and what you learned.
- Obtain the placement letter and supervisor details before you start.
- Your final report and assessor's evaluation are part of your assessment.
- Follow the Industrial Training Fund and AOU SIWES guidelines throughout.

6. Assessment and Academic Regulations

Assessment follows the university's approved academic regulations, which govern grading, attendance, progression, carry-over and classification. This summary does not replace those regulations.

- Continuous assessment (CA) is set by course. Examinations form the remainder unless a course states otherwise.
- Practical and laboratory courses are assessed on reports, practical work and, where stated, a viva.
- Design projects and the final-year defence are assessed by a panel using published rubrics.
- Report any missed assessment through the department as soon as possible, with supporting evidence.
- Grading and classification are as set out in the regulations: [insert AOU grading table].

7. Student Support and Conduct

- **Academic advising:** each student is assigned an adviser. Meet your adviser at least once a semester.
- **Academic integrity:** plagiarism, falsified data and unauthorised collaboration are serious offences.
- **Respect and inclusion:** treat staff, colleagues and communities with dignity; report harassment through the appropriate channel.
- **Wellbeing:** seek help early from your adviser or the university welfare services.

8. Laboratory, Workshop and Field Safety

- Wear the prescribed personal protective equipment (PPE) in laboratories, workshops and on sites.
- Follow the instructions of the technician and lecturer. Never operate equipment you have not been trained to use.
- Report every accident, near miss and damaged equipment immediately.
- Microbiology work uses biological agents: follow the biosafety rules, wear PPE and disinfect all surfaces.
- Biogas is flammable and can contain hydrogen sulphide: work in ventilated areas with gas detection.
- Machinery power take-offs and moving parts cause serious injury: keep guards in place and never work near a running PTO.
- Grain and dust handling can create explosive atmospheres: control dust and avoid ignition sources.
- Seafood processing involves sharp tools and cold surfaces: use cut-resistant gloves and follow hygiene procedures.

9. Contacts

Role	Name	Contact
Head of Department	[to be inserted]	[to be inserted]
Programme coordinator	[to be inserted]	[to be inserted]
Level advisers	[to be inserted]	[to be inserted]
SIWES coordinator	[to be inserted]	[to be inserted]

Role	Name	Contact
Laboratory technical officer	[to be inserted]	[to be inserted]