Michael Okpara University of Agriculture, Umudike.

COLLEGE OF ENGINEERING AND ENGINEERING TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

UNDERGRADUATE HANDBOOK

PROF. MADUEBIBISI OFO IWE
THE VICE–CHANCELLOR

ENGR. PROF. BERTHRAND NDUKA NWANKWOJIKE
DEAN
CEET

ENGR. DR. (MRS) IJEOMA FRANCISCA IKECHUKWU

HOD

MEE

PREFACE

On behalf of the Department of Mechanical Engineering, I am delighted to introduce this comprehensive handbook, designed to guide you throughout your undergraduate program at Michael Okpara University of Agriculture, Umudike. This handbook provides essential information to help you navigate your academic journey, addressing common questions and concerns that may arise.

The philosophy and objectives of the Mechanical Engineering program are outlined in this handbook, along with the expected outcomes of each course. You will find guidance on various academic issues, as well as information on the University's rules and regulations.

As a member of this academic community, it is essential to understand that our University values order and civility. We encourage you to speak up if you experience any issues, while also respecting the rights and privileges of others. This handbook outlines the code of conduct, offenses, and associated penalties, ensuring that you are aware of your responsibilities and obligations.

I warmly welcome you to the Department of Mechanical Engineering and recommend that you familiarize yourself with this handbook. It will serve as a valuable resource throughout your program.

Engr. Dr. I.F. Ikechukwu
Ag. Head, Department of Mechanical Engineering
May 2025

TABLE OF CONTENTS

LIST OF TABLES

SECTION 1

MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE (MOUAU)

1.1 MOUAU's PHILOSOPHY

The Michael Okpara University of Agriculture, Umudike conceives food as one of the indicators of state power and national security. The University is anchored on the philosophy that national development could be enhanced by properly integrated and coordinated agricultural education. Thus, the University strives to contribute to Nigeria's greatness through self-sufficiency in food and fibre production as disseminated through teaching, research, training and extension.

1.1.1 MOUAU's VISION

The **Vision** of the University encapsulates its original purpose and what used to be referred to as its Mission and Mandate. The rehearsing of this vision gives anyone associated with it the expectations of the Institution. The University aims to provide the knowledge base for achieving food security, hence its motto: **Knowledge, Food and Security**. The University, therefore, has the vision to serve Nigeria and humanity through processes that will lead to the alleviation of hunger.

1.1.2 MOUAU's MISSION

The **Mission** of the University is to provide high-quality practical training for students to become professionally competent and confident persons capable of self-employment, to develop environment-friendly and person-sensitive technologies; and to enhance the well-being of the people through extension services and other interventions.

1.1.3 MOUAU's CORE VALUES

Excellence, Integrity, Commitment, Fairness, and Justice.

1.1.4 MOUAU's GOAL

The overall **goal** is to provide the training of students in a rural setting, aimed at self-reliance, through the inculcation of appropriate entrepreneurship skills.

1.1.5 MOUAU's OBJECTIVES

The objectives of Michael Okpara University of Agriculture, Umudike are as follows; -

1. To encourage the advancement of learning and to hold out to all persons without distinction of race, creed, sex or political conviction, the opportunity of acquiring a higher education in Agriculture;
2. To develop and offer academic and professional programmes leading to the award of diplomas, first degrees, postgraduate research and higher degrees which emphasize planning, technical, maintenance, developmental and adaptive skills in Agriculture, Agricultural Engineering and Engineering Technology and allied professional disciplines with the aim of producing socially mature persons with capacity to improve on those disciplines and develop new ones, but also to contribute to the scientific transformation of agriculture in Nigeria;

3. To act as agents and catalysts, through postgraduate training, research and innovation for the effective and economic utilization, exploitation and conservation of Nigeria's natural, agricultural, economic and human resources;
4. To offer to the general population as a form of public service, the results of training and research in agriculture and allied disciplines and to foster the practical application of those results;
5. To establish appropriate relationship with other national institutions involved in training, research and development of agriculture;
6. To identify the agricultural problems and needs of Nigeria and to find solutions to them within the context of overall national development;
7. To provide and promote sound basic scientific training as a foundation for the development of agriculture and allied disciplines, taking into account indigenous culture, the need to enhance national unity, the need to vastly increase the adequate preparation of graduates for self-employment in agriculture and allied professions;
8. To promote and emphasize teaching, research and extension of agricultural knowledge including agriculture extension services and out-reach programmes, in-service training, continuing education, and on-farm adaptive research;
9. To offer academic programme in relation to the training of manpower for agriculture in Nigeria;
10. To organize research relevant to training in agriculture with emphasis on small scale farming;
11. To organize extension services and outreach programmes for technology transfer;
12. To establish institutional linkages in other to foster collaboration and integration of training, research and extension activities; and
13. To undertake any other activities, appropriate for Universities of Agriculture

In view of the above stated mission and objectives, and while fully aware of its national responsibilities, the University will ensure that its research and extension activities are responsive to the needs of the farmers in the agro-ecological zone in which it is located. Specifically, the University will adopt the bottom-to-up approach in the planning and implementation of research, and in development and transfer of technology to the farmers. Hence, the immediate enhancement of the well-being of the farmers is the focal point of the University.

1.2 CEET's PHILOSOPHY

The College of Engineering and Engineering Technology (CEET) in Michael Okpara university of Agriculture Umudike is committed to entrepreneurial and transformational education, responsible research and community services for advancing national development through self-sufficiency in food/fibre production and innovative solutions to real-world challenges.

1.2.1 CEET's VISION

To lead in tech-manpower development and impactful research for sustainable agriculture and industrialization

1.2.2 CEET's MISSION

To provide high-quality engineering education that stimulates trainees' ingenuity and originality to become highly proficient, self-reliant professionals capable of driving positive societal change through technological innovations for equitable future.

1.2.3 CEET's CORE VALUES

Excellence, Honesty, Lifelong learning and Societal Impact

1.2.4 CEET's GOALS

Our goals are to:

- Produce highly skilled and industry-relevant engineering professionals equipped to lead sustainable development efforts across agro-industrial and allied sectors.
- Promote interdisciplinary research that drives innovation and technological advancement
- Stimulate impactful partnerships and collaborations that translate research outcomes into scalable entrepreneurial solutions for societal needs.

1.2.5 CEET's OBJECTIVES

The outlined goals will be achieved through the following:

- Creating inclusive and challenging academic environment conducive for positive teacher-student relationships and interactive learning experiences.
- Delivering training with outcome-based curricula for driving the advancement of national development policies and strategies.
- Stimulating trainees' ingenuity, originality, lifelong learning. leadership and team capabilities
- Collaborating with industry partners and agricultural organizations to translate research into market-ready solutions and ventures for addressing societal challenges and achieving a sustainable future.
- Championing staff and students' internship and community service engagement.

SECTION 2

2.1 Programme Overview

Mechanical Engineering is a discipline that applies the principles of physics, mathematics, materials science, and engineering problem-solving techniques to the design, analysis, manufacture, operation, and maintenance of mechanical systems. The goal is to ensure cost-effectiveness, safety, reliability, and efficiency in these systems. The field leverages modern tools such as Computer-Aided Design (CAD), Computer-Aided Manufacturing (CAM), and Product Life-Cycle Management (PLM) to analyze and develop a wide range of engineering solutions.

The curriculum at the Department of Mechanical Engineering, Michael Okpara University of Agriculture, Umudike, aligns with contemporary global trends in mechanical engineering education. It emphasizes the development of materials, mass, momentum, and energy balances, leading to the geometric representation of the fundamental conservation laws of nature. These principles form the foundation of key areas of specialization, including Applied Mechanics, which focuses on the behavior of solid bodies under external forces, stresses, and vibrations, with applications in the design, construction, and manufacturing of mechanical structures. Fluid Mechanics explores the behavior of liquids and gases, applying this knowledge to the development of machinery and systems such as pumps, turbines, fans, and piping networks. Thermal Engineering, encompassing Thermodynamics and Heat Transfer, deals with energy conversion processes, including the transformation of thermal energy into mechanical work, with applications in power plants, engines, and HVAC (Heating, Ventilation, and Air Conditioning) systems.

Mechanical Design and Manufacturing Engineering integrates applied mechanics, materials science, and manufacturing processes to develop innovative solutions through advanced software tools for modeling, simulation, and optimization. Industrial Engineering and Management Sciences focus on optimizing complex systems and processes to improve efficiency, productivity, and sustainability. This field integrates mechanical engineering principles with automation, data analytics, and supply chain management to enhance industrial operations and drive economic growth.

The Department of Mechanical Engineering at Michael Okpara University of Agriculture, Umudike, plays a vital role in technological and industrial development by equipping students with a strong foundation in engineering principles, research, and practical applications. It fosters innovation and problem-solving, preparing graduates for careers in industry, research, and academia. Industrial and Systems Engineering focuses on process optimization and automation, streamlining manufacturing processes, improving supply chain efficiency, and enhancing resource utilization. Design and Production Engineering involves the conceptualization, development, and manufacturing of mechanical components and systems, incorporating product design, prototyping, advanced manufacturing techniques, and quality control for industries such as automotive, aerospace, and consumer goods.

Energy and Power Engineering addresses energy generation, distribution, and utilization, focusing on thermal power systems, renewable energy, and sustainable energy solutions. Engineers in this field work to enhance power plant efficiency, develop energy storage technologies, and advance clean energy innovations. Materials and Metallurgy examines engineering materials, metallurgical processes, and material performance, driving advancements in lightweight materials, high-performance alloys, and nanotechnology applications in industries such as aerospace, construction, and biomedical engineering.

The Department remains committed to advancing knowledge and fostering innovation in mechanical systems, energy transformation, and industrial development. Through industry collaborations, research initiatives, and hands-on training, it prepares students to tackle real-world engineering challenges and contribute to technological progress and economic growth.

2.2 History of the Department

The Department of Mechanical Engineering, under the College of Engineering and Engineering Technology at Michael Okpara University of Agriculture, Umudike, was established during the 2003/2004 academic session. Its primary objective is to train highly skilled engineering professionals with profound theoretical knowledge and practical expertise. The Department focuses on developing new technological tools—from machines to innovative techniques—while optimizing and modifying existing systems to meet the growing demands for material goods and essential services. Through a rigorous academic curriculum and hands-on training, the Department prepares graduates to contribute effectively to technological advancements in various industries.

The Department offers an undergraduate program leading to the award of a Bachelor of Engineering (B.Eng.) in Mechanical Engineering. The program is designed to give students a strong foundation in engineering principles, fostering creativity, analytical thinking, and problem-solving skills for addressing real-world engineering challenges. Over the years, the Department has expanded its academic offerings to include postgraduate studies, allowing for advanced research and specialization in key areas of mechanical engineering.

Academic activities officially commenced in the 2003/2004 academic session with an initial enrollment of twenty (20) undergraduate students. The Department launched its postgraduate program in the 2012/2013 academic session to further strengthen research and professional expertise, admitting twenty (20) students in its first intake. Since its establishment, the Department has steadily grown in student population, faculty strength, and research output, making significant contributions to engineering education and industrial development.

At its inception, the Department of Mechanical Engineering was coordinated by Engr. Dr. O. Onuba was the Dean of the College of Engineering and Engineering Technology at the time. In April 2005, Engr. Dr. E.A. Ogbonnaya was appointed the acting Head of the Department, providing leadership and laying a solid academic and administrative foundation. In 2008, Engr. Prof. C. I. Ezekwe took over as the Head of the Department, guiding the Department's growth and development. Upon completing his tenure in 2011, Dr. Ogbonnaya was reappointed as acting Head of Department, a position he held until Engr. Prof. A. I. Obi assumed office in September 2012.

The Department continued its leadership transitions with Engr. Dr. B.N. Nwankwojike who took over in August 2015, followed by Engr. Dr. F. I. Abam in February 2017 and Engr. Dr. C.H. Kadurumba in January 2021.Under their leadership, the Department strengthened its academic programs, research initiatives, and collaborations with industry stakeholders. In January 2024 Engr. Dr. I. F. Ikechukwu was appointed the substantive acting Head of the Department, continuing the academic excellence and innovation mission.

Over the years, the Department of Mechanical Engineering has remained committed to producing highly competent engineers capable of driving technological progress in various sectors. The

Department contributes significantly to national and global engineering advancements through its robust academic programs, research activities, and industry collaborations.

2.3: PHILOSOPHY AND PROGRAMME OBJECTIVES OF MECHANICAL ENGINEERING

2.3.1 Philosophy of the Programme

The Mechanical Engineering programme at Michael Okpara University of Agriculture, Umudike, is committed to producing self-reliant, confident, and highly skilled graduates with both academic and practical expertise to address modern engineering challenges. It develops innovative, solution-driven professionals capable of applying scientific and engineering principles to the design, analysis, manufacturing, and maintenance of mechanical systems. By fostering ingenuity, originality, and problem-solving skills, the programme ensures graduates make meaningful contributions to industry and society.

Aligned with the University's mission to advance agricultural and technological education, the programme emphasizes the application of engineering knowledge to industrial and agricultural development. It trains engineers to design and improve machines, structures, and production processes that enhance industrial efficiency and promote agricultural mechanization. The curriculum provides a strong foundation in fundamental engineering sciences, with a focus on applied design, innovation, and hands-on experience.

Encouraging creativity, critical thinking, and technical proficiency, the programme prepares graduates to address emerging challenges in energy production, materials development, automation, and manufacturing. By integrating theoretical instruction with laboratory training, research, and industrial exposure, it equips students for careers in industry, research institutions, and entrepreneurship.

Beyond technical competence, the programme instills ethical engineering practices, professional responsibility, and a commitment to sustainable development. Graduates are expected to be socially responsible, environmentally conscious, and capable of driving technological advancements for economic growth and global competitiveness.

Through continuous curriculum refinement, research innovation, and industry collaboration, the Mechanical Engineering programme remains dedicated to shaping the future of engineering. It strives to produce graduates who meet evolving societal needs, advance technological progress, and contribute to national and global development.

2.3.2 Mission of the Department of Mechanical Engineering, Michael Okpara University of Agriculture, Umudike

The Department of Mechanical Engineering at Michael Okpara University of Agriculture, Umudike (MOUAU) aligns with the University's broader mission by focusing on excellence in education, research, and technological innovation. The Department is committed to producing highly skilled engineers with the theoretical knowledge, practical expertise, and innovative mindset needed to drive industrial and technological advancement in Nigeria and beyond. The Department aims to achieve this mission through:

1. Quality Engineering Education: Providing a rigorous curriculum that blends fundamental engineering principles with practical applications to develop competent mechanical engineers.
2. Cutting-Edge Research and Innovation: Conducting impactful research in mechanical systems, manufacturing processes, energy solutions, and materials development to address industrial and societal challenges.
3. Industrial and Agricultural Advancement: Developing technologies that support industrial growth, agricultural mechanization, and national development through engineering solutions tailored to local and global needs.
4. Entrepreneurial and Professional Development: Equipping graduates with the skills to become innovators, problem-solvers, and industry leaders capable of driving technological transformation and economic progress.
5. Sustainability and Ethical Engineering Practices: Promoting environmentally friendly and socially responsible engineering solutions to support sustainable energy, materials, and manufacturing development.

Through these commitments, the Department of Mechanical Engineering plays a vital role in fostering technological innovation, industrial progress, and sustainable development, which aligns with the core objectives of Michael Okpara University of Agriculture, Umudike**.**

2.3.3 Vision of the Department of Mechanical Engineering, Michael Okpara University of Agriculture, Umudike

The vision of the Department of Mechanical Engineering at Michael Okpara University of Agriculture, Umudike (MOUAU) is derived from the University's overarching vision of being a leading institution in agricultural, technological, and industrial development. The Department aspires to be a center of excellence in mechanical engineering education, research, and innovation, producing world-class engineers who drive industrial transformation, technological advancement, and sustainable development.

The Department envisions:

1. Becoming a hub for cutting-edge engineering research and technological innovation that contributes to industrial growth, agricultural mechanization, and national development.
2. Training highly skilled mechanical engineers with advanced knowledge and hands-on expertise to address engineering challenges in energy, manufacturing, automation, and materials science.
3. Fostering industry-driven and problem-solving education that prepares graduates to be engineering, entrepreneurship, and sustainable technology leaders.
4. Advancing environmentally friendly and sustainable engineering solutions to support national and global efforts in energy efficiency, renewable energy, and eco-friendly manufacturing.

By striving for excellence in education, research, and industry collaboration, the Department of Mechanical Engineering at MOUAU aims to be recognized as a leader in mechanical engineering innovation and technological development, both nationally and globally.

2.4 Aim of the Programme

The Mechanical Engineering Programme at Michael Okpara University of Agriculture, Umudike (MOUAU) aims to produce highly skilled, innovative, and ethically responsible engineers with theoretical knowledge and practical expertise to solve engineering challenges in various sectors. The programme is designed to train graduates who can contribute to technological advancements, industrial growth, agricultural mechanization, and sustainable development by applying mechanical engineering principles.

2.4.1 Objectives of the Programme

The specific objectives of the Mechanical Engineering Programme at MOUAU include:

1. To provide a strong foundation in mechanical engineering principles through a well-structured curriculum that integrates theoretical knowledge with hands-on practical training.
2. To develop problem-solving, analytical, and critical thinking skills for designing, manufacturing, optimizing, and maintaining mechanical systems in industries and research institutions.
3. To equip students with advanced knowledge in key areas of specialization, including Industrial and Systems Engineering, Design and Production, Energy and Power Engineering, and Materials and Metallurgy, to meet the demands of modern industries.
4. To promote research, innovation, and technological development in mechanical engineering, focusing on solving real-world engineering problems and improving industrial and agricultural productivity.
5. To foster entrepreneurship and self-reliance by equipping graduates with the technical and managerial skills to establish and manage engineering-based businesses.
6. To encourage using environmentally sustainable and energy-efficient engineering solutions that contribute to global efforts in climate change mitigation and sustainable industrial practices.
7. To enhance students' professional and ethical values**,** ensuring that graduates uphold the highest standards of engineering ethics, safety, and responsibility in their careers.
8. To establish strong industry collaborations and linkages that expose students to real-world engineering challenges through internships, industrial training, and research partnerships.
9. To prepare graduates for further studies and professional certification**,** enabling them to pursue postgraduate education, specialized training, and membership in professional engineering bodies locally and internationally.
10. To contribute to national development by producing graduates who can drive technological transformation and improve Nigeria's industrial, energy, and agricultural sectors through mechanical engineering innovations.

By achieving these objectives, the Mechanical Engineering Programme at MOUAU ensures that graduates are well-prepared to excel in various engineering fields, contribute to industrial and technological growth, and play a significant role in national and global development.

2.4.2 Programme Administration Form

The Head of Department is appointed by the Vice-Chancellor and is in charge with the overall responsibility of organization, coordination and supervision of the various academic activities and day to day running of the Department. The Head of Department reports and takes instructions from the Dean of the College. There is a Departmental Board, which meets regularly to deliberate on matters affecting the Department. Departmental Committees are also set up to deal with some specific matters. The Departmental Board makes appropriate recommendations to Senate and other University bodies through the College Board of the College of Engineering and Engineering Technology (CEET).

2.4.3 Personnel Administration

The Organizational structure of running the Department is as shown in the flow chart below.

a) Organizational/Administrative Structure is shown Figure 2.1.

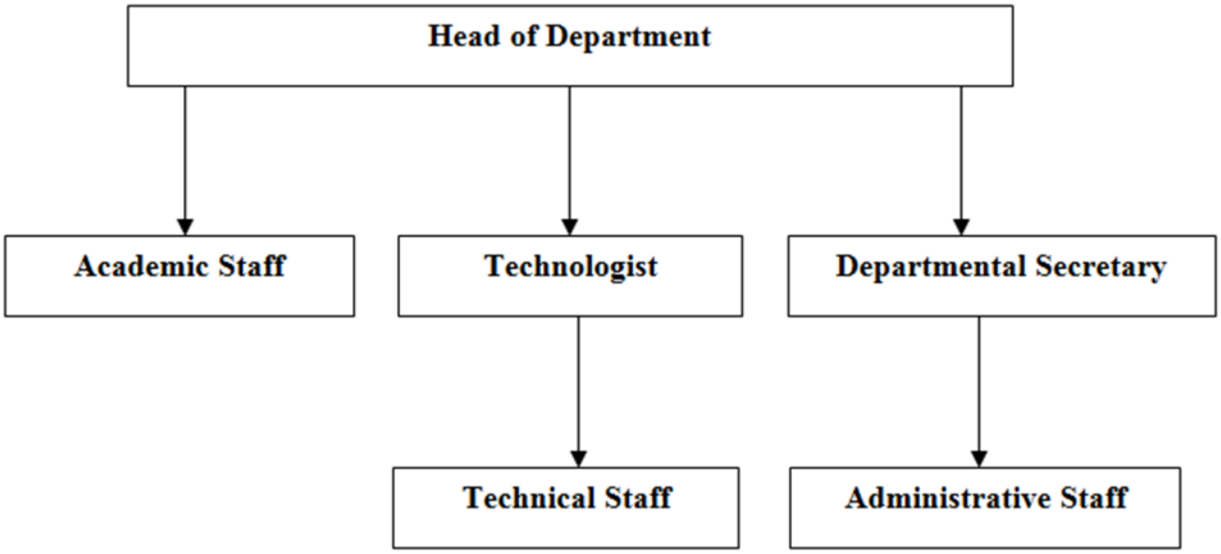


Figure 1.1: Chart Representing Organizational Structure of the Department

The day-to-day personnel administration is carried out by the Head of Department. The Department holds its regular Departmental meetings in accordance with the requirements of Senate. Major policies affecting staff and students and their welfare are discussed extensively before they are adopted. Also at the beginning of each session, the Head of Department nominates members into the various Departmental committees that assist in the running of the department. These Committees help to get staff involved in the general administration of the department.

2.5 Core Values of the Department

The Department **i**s guided by core values that shape its academic and professional philosophy. These values define the Department's commitment to excellence, innovation, and ethical responsibility in engineering education, research, and practice.

2.5.1 Excellence

The Department is committed to providing high-quality education, research, and training that meets international standards. It strives for academic and professional excellence in producing graduates who can compete globally.

2.5.2 Innovation and Creativity

The Department fosters a culture of innovation, creativity, and critical thinking in solving engineering problems. It encourages students and faculty to explore new technologies and develop cutting-edge solutions in mechanical engineering and related fields.

2.5.3 Practical and Hands-on Learning

Emphasizing applied knowledge and skills, the Department ensures that students gain hands-on experience through laboratory work, industrial training, and research projects, preparing them for real-world engineering challenges.

2.5.4 Integrity and Ethical Responsibility

Upholding the highest standards of honesty, professionalism, and ethics**,** the Department instils in students a sense of responsibility towards society, ensuring that they apply engineering principles in an ethical and socially responsible manner.

2.5.5 Sustainability and Environmental Consciousness

The Department is committed to promoting sustainable engineering solutions that minimize environmental impact. Research and training emphasize energy efficiency, renewable energy, and environmentally friendly materials and manufacturing processes.

2.5.6 Industry Relevance and Collaboration

Recognizing the importance of industry-academia partnerships, the Department maintains strong ties with industries and research institutions, ensuring students are exposed to industry-driven innovations and best practices.

2.5.7 Entrepreneurship and Leadership

The Department equips students with entrepreneurial skills and leadership qualities that empower them to create job opportunities, establish engineering businesses, and lead innovations in mechanical engineering.

2.5.8 Teamwork and Collaboration

The Department fosters teamwork, interdisciplinary collaboration, and knowledge sharing among students, faculty, and industry professionals to enhance problem-solving and technological development.

2.5.9 Continuous Learning and Development

Encouraging lifelong learning**,** the Department supports continuous professional development, research advancement, and adaptation to emerging mechanical engineering and technology trends.

By adhering to these core values**,** the Department of Mechanical Engineering, MOUAU, remains dedicated to producing competent engineers who contribute meaningfully to industrial, technological, and national development while upholding ethical and professional standards.

2.6 The Programme Educational Outcomes (PEOs)

The Department is designed to produce competent, innovative engineers who can contribute to technological and industrial advancement. The following five Programme Educational Outcomes (PEOs) define the core objectives of the programme as in Table 2.1:

Table 2.1: Programme Educational Objectives

S/N	***PEO***
PEO1: Technical Proficiency and Innovation	Graduates will demonstrate strong foundational knowledge and practical skills in mechanical engineering, enabling them to design, develop, and innovate solutions that improve agricultural productivity and promote sustainable food systems**.**
PEO2: Career and Professional Development	Graduates will pursue successful careers in industry, academia, government, or entrepreneurship, particularly in sectors that support agricultural mechanization, food processing, energy, and national development
PEO3: Industry Readiness and Professionalism	Graduates will possess the technical, managerial, and ethical skills required for successful careers in engineering industries, research institutions, and entrepreneurial ventures, ensuring they contribute effectively to national and global development.

PEO4: Lifelong Learning and Adaptability	Graduates will demonstrate a commitment to continuous learning, professional development, and adaptability by pursuing further education, obtaining certifications, and keeping up with emerging technologies in mechanical engineering.
PEO5: Leadership, Teamwork, and Ethical Responsibility	Graduates will exhibit strong leadership, teamwork, communication, and ethical decision-making skills, enabling them to collaborate effectively in multidisciplinary environments and uphold professional and social responsibilities in their engineering practices.

These Programme Educational Outcomes (PEOs) ensure that graduates from the Department of Mechanical Engineering, MOUAU, are well-prepared to excel in their careers, drive technological advancements, and contribute to national and global engineering solutions.

2.7 Programme Outcomes and Graduate Characteristics

The Department of Mechanical Engineering at Michael Okpara University of Agriculture, Umudike (MOUAU) is committed to producing highly skilled engineers with the competencies required to address real-world engineering challenges. The programme is designed to equip graduates with technical knowledge, problem-solving abilities, and professional skills that align with global engineering standards.

2.7.1 Programme Outcomes (POs)

Upon successful completion of the Mechanical Engineering Programme, graduates will be able to carry out the following characteristics as presented in Table 2.2:

Table 2.2: Programme Outcomes and Graduate Characteristics

S/N	***Characteristics***	***Programme Outcome (Engineer Graduate Profile)***
PO1	Engineering Knowledge	Apply knowledge of mathematics, science, and fundamental mechanical engineering principles to solve complex engineering problems.
PO2	Problem Analysis	Identify, formulate, and analyze engineering problems using scientific and engineering principles to develop feasible solutions.
PO3	Design and Development of Solutions	Design mechanical components, systems, and processes that meet societal, environmental, and industrial needs while considering safety and sustainability.
PO4	Investigation and Research	Conduct experiments, analyze data, and apply research methodologies to improve mechanical engineering processes and technologies.
PO5	Modern Tool Usage	Utilize modern engineering tools, simulation software, and digital technologies for modeling, designing, and analyzing mechanical systems.
PO6	The Engineer and Society	Assess and apply engineering principles to address societal, economic, health, and safety issues**,** ensuring responsible and ethical decision-making.
PO7	Environmental and Sustainability Awareness	Develop engineering solutions that promote energy efficiency, sustainability, and environmental conservation in line with global best practices.
PO8	Ethics and Professional Responsibility	Uphold ethical standards, engineering codes of conduct, and professional responsibilities in all aspects of mechanical engineering practice.
PO9	Communication Skills	Communicate effectively through technical reports, presentations, and documentation**,** ensuring clarity and precision in engineering discourse.
PO10	Teamwork and Leadership	Function effectively as an individual, team member, or leader in multidisciplinary and multicultural engineering environments.

PO11	Project Management and Entrepreneurship	Apply engineering and management principles to lead projects, optimize resources, and drive entrepreneurship in mechanical engineering industries.
PO12	Lifelong Learning	Engage in continuous learning, self-improvement, and professional development to stay updated with emerging trends and innovations in mechanical engineering.

2.8 Knowledge Attributes Profile

The Mechanical Engineering curriculum at MOUAU is designed to equip graduates with multi-disciplinary knowledge, sustainability consciousness, and technological expertise in line with the United Nations Sustainable Development Goals (SDGs). Through research, innovation, and ethical engineering practices, graduates will be well-prepared to contribute to global efforts in climate action, industrial development, clean energy, economic growth, and social equity. These attributes are shown in Table 2.3.

Table 2.3: Knowledge Attributes Profile

S/N	*Attribute*
K1	Graduates will acquire knowledge of renewable energy technologies, energy efficiency, and sustainable manufacturing to promote clean energy solutions and mitigate climate change impacts. Emphasis is placed on eco-friendly engineering designs, resource conservation, and environmental protection
K2	The curriculum integrates materials science, metallurgy, and nanotechnology to develop sustainable and high-performance materials for industrial applications. Knowledge of smart manufacturing techniques, waste reduction, and circular economy principles promotes responsible production and consumption.
K3	Students learn about energy generation, conversion, distribution, and storage technologies, focusing on renewable energy systems and decarbonization to support clean and affordable energy solutions. Studies in power plant optimization, thermal systems, and hybrid energy solutions contribute to sustainable industrialization
K4	The curriculum fosters knowledge in industrial automation, robotics, and lean manufacturing to drive industrial productivity and economic development. Graduates will be skilled in process optimization, supply chain management, and systems thinking to enhance efficiency and sustainability.
K5	The programme emphasizes engineering design principles, CAD modelling, and prototyping for innovative product development. Knowledge of sustainable urban infrastructure, transportation systems, and smart city technologies is incorporated into the curriculum.
K6	Graduates will be equipped with strong ethical, leadership, and decision-making skills to promote responsible engineering practices and governance. The curriculum encourages collaborative projects, multidisciplinary teamwork, and global partnerships to address complex engineering challenges.
K7	The programme covers occupational health and safety, engineering risk assessment, and human-centered design to ensure workplace safety and product reliability. Knowledge of clean water technologies, biomedical engineering applications, and ergonomic designs supports good health and well-being.
K8	i The curriculum incorporates business development, engineering management, and innovation-driven entrepreneurship to reduce poverty and create sustainable jobs. ii Students are encouraged to develop engineering solutions for small-scale industries and local economies to minimize inequalities.
K9	Knowledge of artificial intelligence, Internet of Things (IoT), data analytics, and automation prepares graduates for the fourth industrial revolution. The integration of digital learning tools, virtual labs, and online collaboration platforms enhances access to quality education and engineering innovation.

2.9 Definition of Complex Problems Solving

Complex problem-solving in Mechanical Engineering refers to the ability to identify, analyze, and develop innovative solutions for engineering challenges that are multifaceted, dynamic, and often require interdisciplinary approaches**.** These problems typically involve multiple constraints, uncertainty, conflicting objectives, and wide-ranging considerations that extend beyond routine engineering tasks. These ranges are shown in Table 2.4.

Table 2.4: Range of Complex Problem-Solving in Relation to Programme Outcomes (PO1-PO12)

S/N	***Characteristics of Complex Problems***	***Programme Outcomes (Engineer Graduate Profile)***
1	Depth of Knowledge Required **–** Solutions require in-depth knowledge of mathematics, physics, material science, and engineering fundamentals, often extending to emerging technologies and interdisciplinary concepts.	PO1 (Engineering Knowledge), PO4 (Investigation and Research), PO5 (Modern Tool Usage)
2	Depth of Analysis Required **–** Problems require extensive problem formulation, critical thinking, and the application of scientific and engineering principles to develop feasible solutions.	PO2 (Problem Analysis), PO4 (Investigation and Research), PO6 (The Engineer and Society)
3	Complexity of Design and Development **–** Solutions require the integration of multiple factors such as safety, sustainability, manufacturability, economics, and environmental impact in designing systems and components.	PO3 (Design and Development of Solutions), PO7 (Environmental and Sustainability Awareness), PO11 (Project Management and Entrepreneurship)
4	Use of Modern Tools and Technologies **–** Engineering challenges require advanced computational tools, software simulations, data analytics, and automation technologies to analyze, design, and optimize solutions.	PO5 (Modern Tool Usage), PO10 (Teamwork and Leadership), PO12 (Lifelong Learning)
5	Interaction with Societal and Environmental Factors **–** Engineering solutions must align with public safety, ethical considerations, economic viability, social impact, and environmental regulations**.**	PO6 (The Engineer and Society), PO7 (Environmental and Sustainability Awareness), PO8 (Ethics and Professional Responsibility)
6	Diversity of Stakeholders and Collaboration – Solving engineering problems requires interaction with multidisciplinary teams, clients, regulatory agencies, and industries**,** necessitating leadership, teamwork, and effective communication.	PO9 (Communication Skills), PO10 (Teamwork and Leadership), PO11 (Project Management and Entrepreneurship)
7	Uncertainty and Lifelong Learning **–** Problems are often open-ended, requiring continuous learning, adaptation to new technologies, and keeping up with global trends and innovations in mechanical engineering.	PO12 (Lifelong Learning), PO8 (Ethics and Professional Responsibility), PO3 (Design and Development of Solutions)

This framework ensures that graduates of Mechanical Engineering at MOUAU develop the necessary problem-solving skills to tackle real-world engineering challenges effectively while aligning with global engineering standards and sustainable development goals**.**

2.10 Definition of Complex Engineering Activities

Graduates of Mechanical Engineering at MOUAU will be prepared to engage in complex engineering activities that require multidisciplinary expertise, ethical decision-making, technological innovation, and global sustainability awareness**.** These skills align with the United Nations Sustainable Development Goals (SDGs) and contribute to technological progress, economic growth, and environmental conservation**.** These activities are shown in Table 2.5.

Table 2.5: Range of Complex Engineering Activities

S/N	*Characteristics of Complex Engineering Activities*	*Attributes*
1	A1: Problem Scope and Uncertainty – Engineering activities involve ill-defined problems with multiple, often conflicting, constraints that require creative solutions.	Involves open-ended problem-solving, innovative thinking, and adaptability to new challenges.
2	A2: Depth of Engineering Knowledge Required – Solutions require profound knowledge of mechanical systems, mathematics, material science, and engineering principles, often integrating interdisciplinary fields.	Requires advanced technical expertise, research capabilities, and continuous learning to stay updated with emerging technologies.
3	A3: Diversity of Stakeholders and Interactions – Projects involve interactions with multiple stakeholders, including industries, government agencies, regulatory bodies, and the public.	Demands effective communication, teamwork, leadership, and ethical responsibility in addressing diverse stakeholder needs.
4	A4: Design and Development Complexity – Solutions require customization, optimization, and integration of multiple components, including mechanical, electrical, and digital systems.	Necessitates critical thinking, computational tools, modern design methodologies, and sustainability considerations.
5	A5: Use of Advanced Tools and Technologies – Engineering solutions require cutting-edge software, computer-aided design (CAD), artificial intelligence, automation, and simulation tools.	Requires competency in digital technologies, system modeling, and analytical tools for predictive analysis and optimization.
6	A6: Social, Economic, and Environmental Impact – Engineering decisions must consider public health, safety, environmental sustainability, and long-term economic feasibility.	Demands knowledge of ethics, regulatory policies, environmental stewardship, and corporate social responsibility.
7	A7: Project Management and Implementation at Scale – Engineering projects involve large-scale industrial production, multi-phase development, budget constraints, and risk assessment.	Requires strategic planning, entrepreneurial mindset, financial management, and leadership in project execution.

2.11 Careers and Opportunities of Graduates

Graduates from the Department of Mechanical Engineering at Michael Okpara University of Agriculture, Umudike (MOUAU) are equipped with a broad skill set, technical expertise, and problem-solving abilities that prepare them for diverse career opportunities in various sectors. The programme's strong emphasis on engineering knowledge, innovation, sustainability, and hands-on experience enables graduates to excel in both traditional and emerging fields of engineering. These careers and opportunities are shown in Table 2.6.

Table 2.6: Career Opportunities for Graduates

S/N	*Job Areas*	*Job Description*	*Job Roles*
1	Manufacturing and Production Engineering	Graduates can work in industries involved in product design, manufacturing, and production processes. They contribute to process optimization, automation, quality control, and lean manufacturing to enhance efficiency and reduce waste.	Manufacturing Engineer, Production Supervisor, Industrial Engineer, and Quality Assurance Engineer
2	Energy and Power Engineering	With increasing demand for sustainable energy solutions, graduates can pursue careers in renewable energy, thermal power generation, and energy management. They work on projects related to power plants, energy storage, and efficient energy distribution.	Power Systems Engineer, Renewable Energy Engineer, Energy Auditor and Thermal Systems Engineer
3	Automotive and Aerospace Engineering	Mechanical engineers play a crucial role in vehicle and aircraft design, propulsion systems, and structural analysis. Graduates can work in industries that focus on	Automotive Engineer, Aerospace Engineer, Vehicle Design Engineer and Propulsion Systems Engineer

		automobile manufacturing, aircraft maintenance, and electric vehicle technology**.**	
4	Materials and Metallurgical Engineering	Graduates can specialize in materials development, metal fabrication, nanotechnology, and corrosion control for various engineering applications. This field is critical in the automotive, aerospace, construction, and manufacturing sectors**.**	Materials Engineer, Metallurgist, Welding and Fabrication Engineer, And Nanotechnology Researcher
5	Robotics, Automation, and Mechatronics	The integration of mechanical systems with electronics and software has opened opportunities in robotics, automation, and smart manufacturing**.** Graduates can work in AI-driven automation, robotic system design, and intelligent manufacturing systems**.**	Robotics Engineer, Automation Engineer, Mechatronics Engineer, and Artificial Intelligence Engineer
6	Oil and Gas Industry	Mechanical engineers are needed in the oil and gas **sector** for pipeline design, drilling operations, and equipment maintenance. They work on offshore and onshore engineering projects to ensure efficiency and safety.	Petroleum Engineer, Drilling Engineer, Pipeline Engineer and Maintenance Engineer
7	Construction and Infrastructure Engineering	Graduates can contribute to structural engineering, HVAC (Heating, Ventilation, and Air Conditioning), and infrastructure development in residential, commercial, and industrial projects.	HVAC Engineer, Structural Engineer, Construction Project Engineer and Building Services Engineer
8	Research, Development, and Academia	Graduates with a passion for innovation and knowledge creation can pursue careers in research institutions, universities, and government agencies**.** They work on cutting-edge technologies, sustainability research, and new mechanical engineering advancements**.**	Research Engineer, Lecturer/Professor, Innovation and Technology Consultant, and Technical Writer
9	Entrepreneurship and Consultancy	Mechanical engineering graduates with an entrepreneurial mindset can establish their own engineering firms, manufacturing businesses, or technology startups**.** Others may work as independent consultants providing expertise in design, energy solutions, and automation**.**	Engineering Consultant, Start-up Founder (Mechanical Tech-based Company), Product Development Entrepreneur and Business Development Engineer
10	Public Sector and Government Agencies	Graduates can work in government agencies responsible for infrastructure development, environmental protection, industrial regulation, and energy policy**.**	Regulatory Compliance Engineer, Public Works Engineer, Policy Analyst for Energy and Industry and Engineering Inspector

The Department of Mechanical Engineering at MOUAU prepares graduates for a wide range of career paths in engineering, technology, research, and entrepreneurship. With the increasing demand for sustainable solutions, digital transformation, and industrial growth**,** mechanical engineers have endless opportunities to make impactful contributions in both local and global markets. Graduates are encouraged to embrace lifelong learning, innovation, and adaptability to remain competitive in the evolving engineering landscape.

SECTION 3

ADMISSION AND GRADUATION REQUIREMENTS

3.1 Admission and COREN Indexing Requirements

Candidates are admitted into the Bachelor of Engineering degree programmes through three (3) modes: Unified Tertiary Matriculation Examination, Direct Entry or Inter-University Transfer modes.

3.1.1 Unified Tertiary Matriculation Examination (UTME) Mode for Five (5)-Year Full-Time Programme

For the five-year degree programme, in addition to acceptable passes in the Unified Tertiary Matriculation Examination, the minimum admission requirement is credit level passes in Senior School Certificate (SSC) in at least five (5) subjects, which must include: English Language, Mathematics, Physics, Chemistry and any other acceptable science subject at not more than two (2) sittings.

3.1.2 Direct Entry (DE) Mode for Four (4)-Year Full-Time Programme

Candidates with good National Diploma (ND: Upper credit pass and above) in relevant Engineering Technology programmes in addition to five (5) Senior School Certificate (SSC) credit passes which must include: English Language, Mathematics, Physics, Chemistry and any other acceptable science subject obtained at not more than two (2) sittings are eligible for admission into 200 level.

3.1.3 Direct Entry (DE) Mode for Three (3)-Year Full-Time Programme

Holders of upper credit pass and above at Higher National Diploma (HND) level in relevant Engineering Technology programmes with five (5) Senior School Certificate (SSC) credit passes which must include: English Language, Mathematics, Physics, Chemistry and any other acceptable science subject obtained at not more than two (2) sittings are eligible for admission into 300 level.

3.1.4 Inter-University Transfer Mode for Minimum of Three (3)-Years Full-Time Residency

A student undergoing undergraduate degree programme in another recognized University may be considered for admission on transfer provided he/she meets the minimum admission requirements of this University, possesses a minimum CGPA of 3.00 and seeks transfer to a programme similar to the one he/she is transferring from. The University deserves the right to conduct a security check on any prospective transfer student.

3.1.5 Performance Standards for COREN Indexing and Progression

Students must pass at least 75 % of the Credit Units in Mathematics, Physics and Chemistry with a minimum Cumulative Grade Point Average (CGPA) of 2.40 to proceed from 100 to 200 Level and qualify for indexing by the Council for the Regulation of Engineering in Nigeria (COREN) and 1.50 to proceed to the next Level from 200 to 500 Levels. Also, a student must offer and pass all the compulsory courses and registered elective courses with a minimum CGPA of 1.50 before graduation.

3.2 Matriculation

Matriculation is a formal academic process that marks the official admission of fresh undergraduate students into the Department of Mechanical Engineering at Michael Okpara University of Agriculture, Umudike (MOUAU). It is a compulsory requirement for all newly admitted students, signifying their acceptance into the University community and their commitment to abide by its rules and regulations. The matriculation ceremony is typically scheduled after the completion of the registration process, and the official date is communicated to students through the appropriate university channels. During the ceremony, all matriculating students are required to take the Matriculation Oath, pledging to uphold the values, ethics, and academic integrity of the institution. Additionally, each student must sign the Matriculation Register, which serves as a formal record of their admission. Failure to participate in the matriculation exercise may result in the forfeiture of admission or restriction from accessing certain academic privileges within the University.

3.3 Deferment of Admission

A candidate who has been offered provisional admission into the Department of Mechanical Engineering at Michael Okpara University of Agriculture, Umudike (MOUAU) may apply for deferment of admission for up to one academic year under exceptional circumstances. The request must be submitted to the University Senate through the Head of Department (HOD) and the Dean of the College of Engineering and Engineering Technology (CEET) within three (3) months from the beginning of the academic session. To be eligible for deferment, the candidate must first pay the prescribed fees and complete the enrollment process. Each deferment application is reviewed on its individual merit, and approval is at the discretion of the University Senate. If the application is granted, the candidate will receive official written notification from the University. A candidate whose deferment is approved must pay the necessary fees and complete the registration process for their programme in the subsequent academic session. Failure to comply with these requirements may result in the forfeiture of admission.

3.4 Change of Programme

Students seeking to change their degree programme within Michael Okpara University of Agriculture, Umudike (MOUAU) must meet specific academic and procedural requirements. A change of programme is not permitted until a student has successfully completed at least one full academic year at the University. To be eligible for a programme transfer, the student must have a Cumulative Grade Point Average (CGPA) of at least 3.00 and must meet the entry requirements of the new programme. Students whose academic qualifications fall short of these requirements will not be considered for a programme change. An application for a change of degree programme must be submitted using the official application form obtainable from the Registrar's Office. Approval is contingent upon a concurrent agreement between the departments and colleges involved, after which the Registrar will convey the Senate's approval to the student. A student who is granted permission to change their degree programme should be aware that the transfer may extend the duration of their studies at the University. Any course previously taken in the former department that is deemed relevant to the new programme, including General Studies courses (GST)—shall be credited to the student. However, any irrelevant courses will remain on the student's official academic record but will not be factored into the calculation of their final CGPA for graduation. The Head of Department (HOD) of the new programme is responsible for determining which courses from the former department will be credited towards the new degree.

SECTION 4

ACADEMIC MATTERS

4.1 CGPA Computation and Degree Classifications

4.1.1 Scoring and Grading of Courses

The Department of Mechanical Engineering at Michael Okpara University of Agriculture, Umudike (MOUAU) uses a five-point scale grading system to assess students' academic performance. The grading system assigns both **l**etter grades and grade points based on percentage scores, as shown in Table 4.1**:**

Table 4.1: Course Grading System used in Mechanical Engineering Department, MOUAU

Percentage Score (%)	***Letter Grade***	***Grade Point (GP)***
70 and above	A	5.00
60-69	B	4.00
50-59	C	3.00
45-49	D	2.00
40-44	E	1.00
Below 40	F	0.00

(a) Minimum Passing Grade

i. The minimum passing grades for all courses is "E" (40%)**.**

ii. A grade of "F" (below 40%) indicates failure in a course, requiring a repeat of the course in a subsequent academic session.

(b) Failure to Sit for Final Examination

i. Any student who fails to sit for the final examination of a registered course without a satisfactory reason will be assigned a grade of "F" (Fail) for that course.

ii. However, under exceptional circumstances, such as proven ill-health (certified by the Director of Medical Services) or other substantiated reasons acceptable to the University Senate**,** a student may be granted permission to take the missed examination at the next available opportunity as a first attempt**.**

(c) Procedure for Requesting a Missed Examination

A student who wishes to be considered for a missed examination must:

1. File an official application for permission within one week after the scheduled examination date.
2. Submit the application through the Head of Department (HOD) and Dean of College for onward transmission to the Senate**.**
3. Await Senate approval before being permitted to take the examination in the next available semester.

Failure to follow the required procedures may result in the automatic retention of an "F" grade**,** which would negatively impact the student's Cumulative Grade Point Average (CGPA)**.**

4.1.2 Computation of Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)

At the end of every semester, each student's Grade Point Average (GPA) **and** Cumulative Grade Point Average (CGPA) are computed and published along with the corresponding letter grades earned in all registered courses for that semester. For the purpose of determining a student's standing at the end of every semester, the Grade Point Average (GPA) system shall be used. The GPA is computed by dividing the total number of Units x Grade Point (TUGP) by the total number of units (TNU) for all the courses taken in the semester as illustrated in Table 4.2 below. The Cumulative Grade Point Average (CGPA) over a period of semesters is calculated in the same manner as the GPA by using the grade points of all the courses taken during the period.

Table 4.2: Calculation of GPA or CGPA

Course	Units	Grade Point	Unit x Grade Point (UGP)
C_1	U_1	GP_1	U_1 x GP_1
C_2	U_2	GP_2	U_2 x GP_2
-	-	-	-
-	-	-	-
C_i	U_i	GP_i	U_i x GP_i
-	-	-	-
-	-	-	-
C_N	U_N	GP_N	U_N x GP_N
TOTAL	**TNU**		**TUGP**

$$TNU = \sum_{i=1}^{N} U_i \qquad TUGP = \sum_{i=1}^{N} U_i * GP_i \qquad CGPA = \frac{TUGP}{TNU}$$

The GPA and CGPA are both computed to two decimal places**.** Table 4.3 shows the CGPA Computation and Degree Classification

Table 4.3: CGPA Computation and Degree Classification

Letter Grade	*Grade Points (GP)*	*Cumulative Grade Point Average (CGPA)*	*Class of Degree*
A	5.00	4.50 – 5.00	First Class Honours
B	4.00	3.50 – 4.49	Second Class Honours (Upper Division)
C	3.00	2.50 – 3.49	Second Class Honours (Lower Division)
D	2.00	1.50 – 2.49	Third Class Honours
E	1.00	1.00 – 1.49	Pass*
F	0.00	0.00 – 0.99	Fail

* The "Pass" classification applies only if permitted by the university regulations. Otherwise, a CGPA below 1.50 may result in academic probation, withdrawal, or non-award of the degree.

Key Considerations:

i. Earning more "E" grades is risky since "E" contributes only 1.00 GP to the CGPA, which may lead to an overall CGPA below 1.50**,** preventing graduation.

ii. Students must ensure they maintain the minimum CGPA requirement (1.50) for graduation**.**

iii. If a student's CGPA falls below 1.50, they may be placed on academic probation or advised to withdraw from the programme.

4.1.3 Graduation Requirements and Classification of B.Eng. Degree

To be eligible for graduation from the Department of Mechanical Engineering **at** Michael Okpara University of Agriculture, Umudike (MOUAU)**,** each student must satisfy both academic and credit unit requirements for the Bachelor of Engineering (B.Eng.) degree**.**

(a) Academic Requirements

1. **Minimum CGPA Requirement**
   i. Each student must attain a final Cumulative Grade Point Average (CGPA) of at least 1.50 (Third Class Honours) to qualify for graduation.
   ii. A CGPA below 1.50 disqualifies a student from being awarded a degree.
2. **Course Completion**
   i. The student must obtain a passing grade in all core (major) courses**,** required ancillary courses**,** General Studies (GST) courses**,** and electives registered throughout the programme.
   ii. A minimum of **210 credit units** must be successfully completed before graduation.
3. **Caution on "E" Grades**
   i. Although an "E" grade (equivalent to 1 Grade Point) is a passing grade, accumulating too many "E" grades can significantly lower a student's CGPA**.**
   ii. If a student meets all other graduation requirements but fails to attain the minimum 1.50 CGPA**,** he/she will not be awarded a degree**.**

(b) Degree Classification

The B.Eng. in Mechanical Engineering is classified based on a student's final CGPA, as shown in Table 4.4:

Table 4.4: Required Range of CGPA for Various Classes of Degree Awarded in the Programme

Class of Degree	***Cumulative Grade Point Average (CGPA)***
First Class Honours	4.50 and above
Second Class Honours (Upper Division)	3.50 – 4.49
Second Class Honours (Lower Division)	2.50 – 3.49
Third Class Honours	1.50 – 2.49
Aegrotat Degree*	Awarded on proven ill-health

(c) Aegrotat Degree

An Aegrotat Degree may be awarded to a student who:

i. Has successfully completed all University-prescribed examinations except the final year examinations due to proven ill-health**.**
ii. The illness must be certified by the Director of Medical Services of the University.
iii. The award of an Aegrotat Degree is at the discretion of the University Senate and is only granted in exceptional cases.

(d) Important Note

Students are advised to strive for higher grades throughout the programme to avoid the risk of falling below the minimum CGPA of 1.50 **in (200level- 500level)** which would result in transfer to a non – engineering programme in the university or withdraw.

4.2 Graduation Requirements

The Bachelor of Engineering (B.Eng.) degree programme in the Department of Mechanical Engineering at Michael Okpara University of Agriculture, Umudike (MOUAU) is designed to equip students with a solid foundation in theoretical knowledge and practical skills. The programme's duration and credit requirements vary based on the mode of admission, ensuring that students meet the academic standards necessary for graduation.

Candidates admitted through the UTME mode must complete a minimum of 180 credit units over five years, spanning at least ten academic semesters. Direct Entry students admitted at the 200 level must complete between 120 and 150 credit units within a four-year programme, covering a minimum of eight semesters. Those admitted directly into the 300 level must complete between 90 and 120 credit units over three years, with a minimum of six semesters. The minimum and maximum credit load per semester are 15 and 24 credit units, respectively.

To qualify for graduation, students must successfully complete and pass all registered courses, including compulsory and elective courses as prescribed by the university, faculty, or department. Additionally, students must achieve a minimum Cumulative Grade Point Average (CGPA) of 1.00. Other graduation requirements include the completion of 15 credit units from the Students Industrial Work Experience Scheme (SIWES), 8 credit units from University General Study courses, and 4 credit units from Entrepreneurship courses.

In determining the class of degree awarded, the CGPA is calculated based on all grades obtained in registered courses, whether compulsory or elective, and whether passed or failed. If a student repeats a course before passing it or substitutes another course for a failed elective, all grades from previous attempts are factored into the GPA computation.

Prerequisite courses must be passed before a student can register for higher-level courses. Students who fail to complete their programme within the standard duration are subject to maximum study limits. UTME candidates must graduate within 15 semesters, Direct Entry students admitted at the 200 level must not exceed 13 semesters, and those admitted at the 300 level must complete their studies within 11 semesters. Failure to meet these time limits results in disqualification from the programme.

4.3 Condition for Placing a Student on Probation

A student shall be placed on **academic probation** if their **Cumulative Grade Point Average (CGPA) falls below 1.00** at the end of any academic year. Academic probation serves as a warning and an opportunity for the student to improve their academic performance within a specified period to avoid withdrawal from the programme.

4.3.1 Conditions and Restrictions

1. Course Registration Limitation
    - i. A student on probation shall not be allowed to register for higher-level courses.
    - ii. The student must only register for:
        - a) Previously failed courses from lower levels.
        - b) Any additional low-level courses from related disciplines, if the total credit load of failed courses falls below 15 credit units in the semester.

2. **Duration of Probation**
    - i. Academic probation lasts for one academic year (two consecutive semesters).
    - ii. The student must improve their CGPA to at least 1.50 by the end of the probationary period to continue in the programme.
3. **Implications of Continued Poor Performance**
    - i. If, after the probationary period, the student's CGPA remains below 1.00**,** they may be advised to withdraw from the programme in accordance with university regulations.

ii. However, a student who shows improvement but has not yet reached the minimum required CGPA may be granted one additional probationary semester at the discretion of the Senate.

4. **Advisory Support**
    i. Students placed on probation shall be assigned an academic advisor or counsellor who will monitor their progress and provide guidance on study habits, time management, and academic improvement strategies.

Probation serves as a corrective measure, allowing students with low academic standing an opportunity to recover before being considered for withdrawal. Therefore, students on probation must take advantage of academic support services and prioritize their studies to improve their performance.

4.4 Condition for Academic Withdrawal

A student may be required to **temporarily or permanently withdraw** from the programme or the University due to academic performance or health-related reasons.

4.4.1 General Withdrawal Conditions

i. Except for academic and health reasons**,** a student may not voluntarily withdraw from the University before completing one academic year of study.
ii. Any request for withdrawal due to health issues must be certified by the University's Director of Medical Services and approved by the Senate.

4.4.2 Temporary Withdrawal Due to Academic Performance

A student shall be required to temporarily withdraw from the University if:

i. Their Cumulative Grade Point Average (CGPA) remains below 1.50 at the end of the probationary year.
ii. The student may be withdrawn for one academic year**,** after which they may apply for re-admission into another programme for which they are qualified.
iii. Application for re-admission must be submitted immediately after the probationary year to ensure timely processing.
iv. Re-admission is not automatic but is subject to:
    i. The recommendation of the new department willing to accept the student.
    ii. The approval of the University Senate.

4.4.3 Permanent Withdrawal

A student shall be required to permanently withdraw from the University if:

i. After re-admission into a new programme, their CGPA remains below 1.50 at the end of the second academic year.
ii. No further opportunity for re-admission shall be granted.

The University aims to support students in achieving academic success. However, students who fail to meet the minimum academic requirements despite probationary and re-admission opportunities may be required to withdraw permanently. It is advised that students facing academic challenges seek early intervention through academic advisors, mentorship programmes, and support services to improve their performance.

4.5 Withdrawal of Certificate, Diploma, or Degree

The University Senate reserves the right to withdraw or revoke any degree, diploma, certificate, or other academic award previously conferred on an individual if it is later discovered that:

1. The award was fraudulently obtained, either through misrepresentation, falsification of credentials, or any other form of academic dishonesty during the admission process or while earning the qualification.
2. The recipient engaged in dishonourable, unethical, or scandalous conduct that brings the integrity and reputation of the University into disrepute.

4.5.1 Procedure for Withdrawal

i. Any allegation of fraud or misconduct shall be thoroughly investigated by the appropriate University authorities.
ii. The affected individual shall be given the opportunity to respond to the allegations before a final decision is made.
iii. If found guilty, the Senate shall formally approve the withdrawal of the award**,** and the individual shall be duly informed in writing.
iv. The University reserves the right to publicly declare the revocation if necessary.

The University upholds the highest standards of academic integrity and ethical conduct. Any violation of these principles may result in serious consequences, including the withdrawal of conferred awards**.**

4.6 Temporary Voluntary Withdrawal

A student who wishes to temporarily withdraw from the University must submit a formal written application to the University Senate through:

1. The Head of Department
2. The Dean of the College

Upon approval by the Senate, the period of voluntary withdrawal shall not exceed one academic year**.**

4.6.1 Conditions for Re-admission

i. After the approved withdrawal period, the student must apply for re-admission before being allowed to resume studies.
ii. Re-admission is not automatic and will be subject to the University's academic regulations and available slots within the programme.

The University encourages students to seek academic or counselling support before making withdrawal decisions to ensure minimal disruption to their educational progress.

4.7 Withdrawal on Health Grounds

A student may voluntarily withdraw or be required to withdraw from the University on health grounds, provided that the withdrawal is certified by the Director of Medical Services of the University.

4.7.1 Conditions for Re-admission

i. The student may be considered for re-admission upon submission of a valid medical report**,** certified by the Director of Medical Services, confirming that they are physically and mentally fit to resume full-time academic work.

ii. The University reserves the right to verify the authenticity of the medical report before granting re-admission.

The decision to withdraw or re-admit a student on health grounds is made with the best interest of the student's well-being and academic success in mind.

4.8 Unruly Behaviour and Disciplinary Withdrawal

A student whose conduct disrupts the smooth delivery of academic activities in a lecture, laboratory, or any instructional setting may be required by the lecturer to withdraw from the session. Failure to comply shall be regarded as misconduct and reported to the Vice-Chancellor through the Dean of the College for appropriate disciplinary action.

Additionally, any form of misconduct within or outside the University that violates the institution's regulations shall attract disciplinary measures. Based on the severity of the misconduct, the University Senate or the Vice-Chancellor, acting on behalf of the Senate**,** may impose penalties such as suspension, expulsion, or rustication, subject to Senate ratification**.**

4.9 Withdrawal due to Indebtedness to the University

The University reserves the right to periodically revise the fees and charges payable by students as approved by the Senate.

A student indebted to the University may be denied access to:

- **i.** Academic instruction and supervision
- **ii.** Library services
- **iii.** Residential accommodation
- **iv.** Laboratories, farms, and other University facilities

Unless granted explicit approval by the Vice-Chancellor, such a student shall not be allowed to register for subsequent academic sessions until all outstanding debts are settled.

4.10 Re-Admission

1. **Permanent Expulsion:**
    - ii. Any student expelled due to misconduct or permanently withdrawn on academic grounds shall not be re-admitted under any circumstances.
5. **Voluntary Withdrawal and Re-Admission:**
    - **i.** A student who voluntarily withdraws from the University may apply for re-admission through the Registrar**,** via their Head of Department and Dean of College**.**
    - ii. The application must be submitted within one academic year from the date Senate approved the withdrawal.
    - **iii.** The Senate shall approve the re-admission or, if approved by the Vice-Chancellor**,** it shall be presented to the Senate for ratification**.**

4.11 Waiver of Semester

A student who has no registered courses for a semester may apply for a waiver by submitting a request to the Chairman of the Senate Business Committee**.** The approval of such a waiver shall be subject to the recommendation of the College Board**.**

4.12 Evaluation Techniques of Student Assessment

4.12.1 Practicals:

By the nature of the programmes in Engineering and Technology, laboratory practicals are very important in the training of students. To reflect the importance of practical work, a minimum of 9 hours per week or 135 hours per semester (equivalent to 3 units) should be spent on students' laboratory practicals. Consequently, some of the courses have both theory and practical components. Thus, in the description of courses to be taken, the number of lecture hours (LH) and the number of practical hours (PH) per semester are indicated. The overall performance of students in such courses is to be based on the evaluation of the performance in written examination (which tests theory) and also the performance in the laboratory work (based on actual conduct of experiments and the reports). The experiments to achieve the practical‘s components of the courses must be designed in quality and quantity to enrich the grasp of the theoretical foundations of the courses. It is left for the department to organize all the experiments in the best way possible. One of the ways to achieve this is to lump all the laboratory practicals under a course, which the student must pass.

4.12.2 Tutorials:

The timetable for courses shall be designed to make provision for tutorials of at least one hour for every four hours of lecture. Thus a 3-unit course of 45 hours per semester should attract about 10 hours of tutorials. Postgraduate students are normally employed to help in giving tutorials to undergraduate students. This is a veritable training ground for academic career.

4.12.3 Continuous Assessments:

Continuous assessment shall be done through essays, tests and practical exercises.

1. Scores from continuous assessment shall normally constitute 30 per cent of the full marks for courses which are primarily theoretical.
2. For courses which are partly practical and partly theoretical, scores from continuous assessment shall constitute 40% of the final marks.
3. For courses that are entirely practical, continuous assessment shall be based on a student‘s practical work or reports and shall constitute 100% of the final marks.

4.12.4 Examinations:

In addition to continuous assessment, final examinations are always given for every course at the end of each semester. All courses shall be graded out of a maximum of 100 marks comprising:

Final Examination: 60% –70%

Continuous assessment (Quizzes, Homework, Tests, Practicals): 30% - 40%.

Each course shall normally be completed and examined at the end of the semester in which it is offered.

4.13 Missed Examinations

1. Missed Exam Due to a Valid Reason:
   i. A student who misses an examination for a cogent reason must apply to the Chairman of the Senate Business Committee for permission to retake the missed exam at the next available opportunity.
   ii. The application must include supporting evidence, such as a medical report certified by the Director of Medical Services or any other justification deemed acceptable by the Senate.

2. Missed Exam Without a Valid Reason:
    i. A student who misses an examination without a valid reason shall be required to retake the course as a failed course (F-grade) in a subsequent semester.

4.14 Course Registration

4.14.1 Period of Registration

All students must register for courses in their respective Departments/Colleges at the beginning of each semester after paying the prescribed fees. The standard registration period is **one week** from the start of the semester. Late registration is generally not permitted. However, in exceptional cases, the Registrar may grant approval for late registration, subject to payment of a late registration fee as determined by the Senate. No student will be allowed to register later than three weeks after lectures have commenced. Students who return late due to illness may be exempted from the late registration fee, provided they present a **certified medical report** from the University Medical Centre.

4.14.2 Minimum/Maximum Credit Unit Load per Semester for Undergraduate Students

Undergraduate students must register for approved courses within their program of study, with a minimum of 15 credit units and a maximum of 24 credit units per semester. However, students with high academic performance may carry additional credit units beyond the 24-unit limit, based on their Cumulative Grade Point Average (CGPA)**,** as shown in Table 4.4.

Table 4.5: Cumulative Grade Point Average and Allowable Excess Credit Load per Semester

Cumulative Grade Point Average (CGPA)	***Excess Credit Load Per Semester***
3.50 and above	3
3.00 -3.49	2
2.00 – 2.99	1
Below 2.00	NIL

Students applying for an excess credit load must process their application at the College level and submit it for Senate approval within four weeks from the commencement of lectures.

4.14.3 Registration of Non-Domicile Courses in the Mechanical Engineering Department

Students enrolled in the Mechanical Engineering Department are required to physically register for courses that are not domiciled within the department. These include but are not limited to Mathematics (MTH 112), Physics (PHY 111), Chemistry (CHM 121), General Studies (GSS 111, 112, 114, 115, 116), and General Engineering (GNT 311).

To ensure proper registration, students must follow these guidelines:

1. **Registration Process**
    i. Students must visit the respective Units, Centres, Departments, or Colleges responsible for offering the non-domicile courses.
    ii. They must complete the official registration process within the designated registration period as stipulated by the University.
2. **Verification and Approval**
    i. After registering, students should verify that their registration details have been correctly captured in the system.
    ii. It is the student's responsibility to ensure that all non-domicile courses appear in their course registration records for the semester.

3. **Adherence to Deadlines**
    i. Students must complete the registration within the official registration period.
    ii. Late registration may attract penalties or may not be entertained except under exceptional circumstances approved by the University authorities.

Failure to adhere to these guidelines may result in the student being unable to sit for examinations or have their results recorded for the affected courses.

4.14.4 Registration and Repeating of Failed Courses (Carry-Over Courses)

Students are required to pass all approved lower-level and prerequisite courses in their academic program before registering for higher-level courses. The minimum passing grade for all courses is "E" (40%)**.**

(a) Key Guidelines for Handling Failed Courses:

1. **Mandatory Course Completion**
    i. It is compulsory for students to pass all registered courses before graduation.
    ii. The University does not offer supplementary or re-sit examinations for failed courses.
    iii. Any student who fails a course must re-register, attend lectures, and retake examinations in the appropriate semester of the following academic year.
2. **Re-registration of Failed Courses**
    i. Failed courses must be re-registered at the next available opportunity, ensuring compliance with the University's regulations on probation, withdrawal, and minimum/maximum credit unit load per semester**.**
    ii. Students must officially include the carry-over courses during the course registration period**.**
3. **Conditions for Carry-Over and Repeating Courses**
    i. Students who fail a course may carry it over to the next academic session while continuing with other courses, provided they do not exceed the maximum semester credit unit load**.**
    ii. Students who exceed the maximum allowable credit load may have to extend their study duration to accommodate failed courses.
4. **Restrictions on Course Repetition**
    i. No student is allowed to repeat or re-register for a course they have already passed**.**
    ii. If a student fails an elective course, they may choose to either repeat the same course **or** register for an alternative elective (if permitted by their department).

Failure to adhere to these regulations may result in administrative consequences, including the inability to graduate within the stipulated time frame.

4.14.5 Registration for SIWES (ENG 400) in the Second Semester of 400 Level

The Student Industrial Work Experience Scheme (SIWES) is a compulsory training program designed to provide students with practical exposure to real-world engineering applications**.** The scheme is essential for fulfilling the academic requirements for graduation.

(a) Key Registration Guidelines for SIWES (ENG 400):

1. **Exclusive Course Registration**
    i. Students are not allowed to register for any other course(s) during the second semester of the 400 level, except ENG 400 (SIWES)**.**

   ii. The SIWES program runs throughout the second semester and extends into the lengthy vacation immediately following the semester.
2. **Industrial Attachment and Supervision**
   i. Qualified students are assigned to industries, government ministries, or research institutes relevant to their engineering discipline.
   ii. The industrial training lasts for six (6) months and is supervised by**:**
      a. Engineering personnel from the host establishment.
      b. An academic staff member from the Department of Mechanical Engineering.
3. **Eligibility Criteria**
   i. To be eligible for SIWES, students must have no more than fifteen (15) outstanding credit units in each of the two semesters of the 400 level**.**
   ii. Students who exceed this limit must clear their outstanding courses before being considered for SIWES.
4. **Importance of SIWES**
   i. SIWES provides students with hands-on experience in engineering practices**,** preparing them for professional careers.
   ii. Completion of ENG 400 is a mandatory requirement for graduation.

Failure to comply with these regulations may result in a delay in graduation and other academic penalties.

4.14.6 Registration for Final Year (B.Eng. Degree) Project and Attainment of Final Year Status

The Final Year Project (EME 500) is a compulsory requirement for the Bachelor of Engineering (B.Eng.) degree and serves as a capstone course that integrates knowledge acquired throughout the program. Registration for this course follows strict academic guidelines to ensure that only eligible students participate.

Eligibility Criteria for Final Year Status and Project Registration

1. **Final Year Status Determination**
   i. A student is considered to have attained final year status if, after registration, the total number of credit units for the session (including the project) falls within the maximum allowable credit load of 24 to 27 units per semester, as determined by his/her Cumulative Grade Point Average (CGPA).
   ii. Additionally, the student must have no outstanding course(s) to register beyond the session.
   iii. The assessment of final year status is conducted at the beginning of the session to determine those eligible to proceed with their final year project.
2. **Registration for Final Year Project (EME 500)**
   i. Only students who have attained final year status are allowed to register for EME 500 (Final Year Project).
   ii. The project registration process follows the university’s guidelines and must be completed within the stipulated registration period.
3. **Assignment of Project Supervisors**
   i. After students attain final year status, the Head of the Department (HOD), through the Departmental Board, assigns each student to a project supervisor.
   ii. Students are not permitted to choose their supervisors, and supervisors are not allowed to select their students.

iii. Project allocation is based on academic considerations, staff expertise, and availability.

4. **Project Guidelines and Expectations**
   i. The Final Year Project is a comprehensive research and development task that requires students to apply theoretical and practical knowledge to solve real-world engineering problems.
   ii. The project must be completed within the academic session, and students are required to follow the department's submission deadlines and defense schedules.
   iii. Regular meetings with the assigned supervisor are mandatory for guidance, progress tracking, and evaluation.

Importance of the Final Year Project

i. The Final Year Project serves as an essential academic and professional training exercise, preparing students for careers in engineering.
ii. It contributes significantly to the final CGPA and must be completed successfully to fulfil graduation requirements.

Failure to meet the outlined criteria may result in delayed graduation or ineligibility to participate in the project defence, which is a critical component of the B.Eng. degree program.

4.14.7 Registration of Spill-Over Courses/Waivers

Undergraduate students who are unable to complete their degree program within the stipulated duration due to outstanding courses are categorized as spill-over students**.** The registration process for spill-over courses and the conditions for semester waivers are outlined below.

1. Registration of Spill-Over Courses

i. Spill-over students who have less than six (6) credit units of outstanding courses are permitted to register only for those courses**,** even if the total registered credit units fall below the university's minimum requirement of 15 credit units per semester**.**
ii. Such students are not required to register additional courses solely to meet the minimum credit unit load.
iii. Registration must be done within the approved course registration period to ensure compliance with academic regulations.

2. Conditions for Semester Waivers

i. If a spill-over student has no outstanding course(s) to register for in a particular semester**,** the student must apply for a waiver for that semester.
ii. The waiver application should be submitted through the student's department and faculty to the Senate for approval.
iii. The Senate will grant a waiver only after a thorough reconciliation of the student's previous academic records**,** ensuring that the student has met all necessary requirements for graduation except for courses scheduled in subsequent semesters.

3. Administrative Procedures

- Students seeking waivers must ensure that their academic records are up-to-date, and all necessary corrections (if any) have been made before submitting a waiver request.

- The waiver process will be certified and approved only after verification by the appropriate academic bodies, including the department, faculty, and Senate Committee on Examinations and Records.

4. Implications of Spill-Over Status

- Extended Duration of Study: Spill-over students may extend their period of study beyond the standard program duration, depending on the number of outstanding courses.
- Financial Implications: Students on spill-over status may be required to pay additional tuition and fees as determined by the university's financial policies.
- Graduation Timeline: Spill-over students must successfully pass all outstanding courses before they can be cleared for graduation and convocation.

By adhering to these guidelines, spill-over students can effectively complete their degree requirements while ensuring compliance with the university's academic policies.

4.14.8 Adding and Dropping of Courses

Students are permitted to modify their course registration by adding or dropping courses, provided they follow the approved procedures and meet the stipulated deadlines. The guidelines for adding and dropping courses are outlined below:

1. Procedure for Adding or Dropping Courses

i. A student who wishes to add or drop a course must obtain and complete the official Course Adjustment Form from the College Dean's Office through the College Officer.
ii. The completed form must be endorsed by the student's academic adviser and submitted to the appropriate office for approval.
iii. Any attempt to modify course registration by simply altering the course registration form manually will be considered invalid and nullified by the university.
iv. Changes to course registration must be reflected in the university's academic records, and students are advised to verify their updated registration status via the university portal or department records.

2. Deadline for Adding or Dropping Courses

i. Students are allowed to add or drop courses only within the first three (3) weeks from the commencement of lectures each semester.
ii. Requests made after the deadline will not be entertained, except in cases of extenuating circumstances, such as medical emergencies or administrative errors, which must be duly verified and approved by the relevant authorities.

3. Implications of Adding or Dropping Courses

a. **Adding a Course**:
    i. The student must ensure that the new course aligns with their academic program and does not exceed the maximum allowable credit unit load per semester.
    ii. The student must attend all missed lectures, complete required coursework, and meet all examination requirements for the added course.
b. **Dropping a Course**:
    i. A dropped course will not appear on the student's academic transcript if the change is made within the approved timeframe.

ii. Failure to officially drop a course within the deadline may result in the course being recorded as "Failed" (F) on the transcript if the student does not sit for the examinations.

4. Advisory for Students

i. Before adding or dropping a course, students should consult their academic advisers to ensure that the changes do not affect their graduation requirements.
ii. Students must confirm that any modifications to their course load comply with the university's academic regulations**,** including minimum and maximum credit load policies.
iii. It is the student's responsibility to ensure that all necessary approvals are secured and that the changes are accurately reflected in their official academic records.

By adhering to these guidelines, students can effectively manage their course registration**,** optimize their academic performance, and avoid unnecessary complications in their academic records.

4.14.9 Moderation of Final Semester Examinations

To ensure the integrity, quality, and comprehensive coverage of the approved syllabus for all courses offered by the Department, the moderation of final semester examinations is carried out at two levels: internal moderation and external moderation (for final year/degree examinations).

1. Internal Moderation

i. All non-degree final semester examinations (for courses below the final year level) undergo internal moderation by the Departmental Board of Examiners.
ii. The Board of Examiners reviews examination questions to ensure they align with the approved syllabus, course objectives, and required academic standards.
iii. The moderation process also involves verifying that the examination questions are clear, unbiased, and of appropriate difficulty level**,** while ensuring that there is a balance between theoretical and practical components of the course.

2. External Moderation for Final-Year/Degree Examinations

a. Final-year **degree examinations** go through **two levels of moderation**:
    i. **Internal Moderation**: Conducted by the Departmental Board of Examiners to evaluate and approve examination questions before they are administered.
    ii. **External Moderation**: After internal moderation, the examination papers are sent to an External Examiner**,** appointed by the University Senate based on recommendations from the Departmental and College Boards**.**
b. The **External Examiner** is responsible for ensuring that the examinations:
    i. Adhere to academic and professional standards.
    ii. Fairly assess students' understanding of the course content.
    iii. Are graded consistently and objectively.
c. The External Examiner also reviews marked scripts**,** ensuring fairness in grading and identifying any discrepancies that may require adjustment.

3. Examination Duration and Scheduling

i. The duration for any written examination shall be no less than two (2) hours and no more than three (3) hours**,** depending on the course and credit load.
ii. Final semester examinations must take place only at the officially scheduled times and venues, as determined by the University Senate or its designated committee**.**

iii. Any changes to the approved examination timetable must be duly approved by the Senate to maintain uniformity and fairness in the examination process.

By adhering to these moderation procedures, the University ensures high academic standards**,** fairness, and credibility in the assessment of students' performance, ultimately upholding the integrity of the degree awarded.

4.14.10 Review of Examination Scripts for Aggrieved Students

The University recognizes that students may occasionally feel unfairly graded in an examination. To ensure fairness, transparency, and accountability, an aggrieved student has the right to request a review of his/her examination script(s) by following the prescribed procedure.

1. Submission of Petition

- **a.** A student who wishes to contest their grade must submit a formal petition to the Chairman of Senate through:
  1. The Head of Department (HOD) of the concerned course.
  2. The Dean of the College offering the course.
- **b.** The petition must be submitted within two (2) months from the official publication of the result by the Registrar**.**
- **c.** The petition must clearly state the reason(s) for the request and provide any relevant evidence to support the claim.

2. Review Process and Procedure

Once the petition is received, the Chairman of Senate shall refer the case to the College offering the course for an independent review. The review process shall follow these steps:

- **a. Preparation of the Examination Script for Review**
  - i. A photocopy of the student’s original answer script shall be prepared for review.
  - ii. All comments, marks, and annotations made by the original examiner/marker shall be removed before the script is sent for review.

- **b. Assignment of Reviewers**

The script shall be re-evaluated by independent examiners, based on the student's level:

- i. **Final-Year Semester Examinations**: The script shall be reviewed by one (1) External Examiner appointed by the University Senate.
- ii. **Non-Final-Year Semester Examinations**: The script shall be reviewed by two (2) Internal Examiners from the same College, excluding the original examiner.

- **c. Determination of the Final Decision**
  - i. For non-final-year examinations, the College Board shall make a final decision on the revised grade.
  - ii. For final-year semester examinations**,** the College Board shall submit its recommendations to the Senate through the Senate Examinations and Timetable Committee for final ratification.
  - **iii.** In both cases**,** the original examiner/marker shall not be involved in the review process.

- **d. Payment of Review Fee**
  - i. A student requesting a review of their examination script must pay a non-refundable fee, as stipulated by the Senate-approved charges.
  - ii. The fee is intended to cover administrative and evaluation costs.

e. Protection of Student Rights

i. No student shall be victimized, penalized, or harassed for requesting a review of their examination script(s)**.**

ii. The University is committed to maintaining an impartial and transparent review process, ensuring that students receive fair and accurate assessments of their academic performance.

By adhering to this structured review process**,** the University upholds its commitment to academic integrity, fairness, and quality assurance in the grading system.

4.14.11 SIWES Rating and Assessment

In engineering education, industrial attachment is very crucial. The minimum duration of the Students Industrial Work Experience Scheme (SIWES) should be 33 weeks accomplished in 3 modules.

SWEP I:	(1 Units) 4 weeks during long vacation at the end of 200-Level session
SWEP II:	(1 Units) 4 weeks during the long vacation at the end of the 300-Level
SIWES III:	(15 Units) 6months from second semester of 400-Level to the beginning of the following session.

SIWES is an important aspect of the education and training of engineering students in the universities organised for exposure to some elements of industrial art as articulated below under the Students Industrial Work Experience Scheme (SIWES) and the Technical Support Unit (TSU). This is being emphasised herein in view of the rather poor handling of SIWES, in particular, in most existing faculties of engineering and technology in the country. It should be noted that Industrial Training as a course involves the following: working successfully in the industry or an industrial setting for the specified period; submitting of a Work Report to the Industrial Training Coordinating Centre at the end of the training period; and presentation of seminar on the industrial training experience.

Faculties of Engineering in universities are expected to organise Students Industrial Work Experience Scheme (SIWES) or what most commonly refer to as Industrial Training. Universities are expected to establish a Unit to coordinate SIWES not only for engineering programmes, but also programmes in other faculties that have SIWES component. The SIWES Unit is to shoulder the following responsibilities: soliciting co-operative placements (jobs) in business, industry, government or service agencies depending upon the needs and qualifications of the student, and placing students on such training assignments after analysing the technical contents; need to establish firm strategy to ensure students get placements and options when they cannot get places; coordinating and supervising the cooperative employment of students in such a way that students have the opportunity of learning useful engineering and technological skills on real jobs and under actual working conditions; conducting follow-up activities regarding all placements by checking regularly each student's job performance through company visits and individual student's interview; assembling individual inventory records of students and employers for the purposes of placements and supervision in addition to maintaining functional departmental and personal records and reports; providing necessary advice to students as to the relevance of their chosen field to the industrial requirements of the country; organizing and conducting students' seminars on Work Reports; and Liaison with NUC, ITF, other agencies and industries on student industrial training programme of the University. The Grading template for SIWES will be:

SIWES Supervision Continuous Assessment (from Industry)	25%
SIWES Supervision/Log Book Grading (by University Supervisor)	25%

SIWES Comprehensive Report	25%
Seminar: Oral presentation (defence) of SIWES activity	25%

(i) and (ii) will be scored for each SIWES upon completion and the weighted average for each student computed. However, the consolidated report for all industrial experience will be submitted for seminar and assessment at the end of the 400-level SIWES. The overall grade will then be collated with the 400-level CGPA.

SECTION 5

MISCONDUCTS, SANCTIONS AND CONFLICT RESOLUTION

5.1 Sanctions for Examination Offences and Misconducts

Sanctions for examination misconduct and other related offences as approved by senate of Michael Okpara University of Agriculture, Umudike at its 245th regular meeting held on January, 29th, 2025. are outlined in Table 5.1.

Table 5.1: Sanctions for Examination Offences and Misconducts

S/N	Offence(s) /Misconduct(s)	Sanctions
1	Communicating with any student in any manner, receiving assistance or giving assistance to another student(s) during examination.	The culprit gets ‘F’ in that course. Repeat of same offence attracts rustication for two (2) semesters.
2	Impersonation in an examination.	Expulsion for the impersonator and the impersonated.
3	Copying or reading from another student’s answer script during an exam or opening one’s script or material for another student to read or copy.	The culprit gets ‘F’ in that course. Repeat of same offence attracts rustication for two (2) semesters.
4	Bringing into the examination hall/room any unauthorized materials such as books, notes, papers, devices, phones, manuscripts etc, whether or not such materials is related to the examination.	First offence attracts rustication for two (2) semesters. Repeat of same offence/misconduct attracts expulsion.
5	Involvement in leaking examination question papers or any form of unauthorized handling of examination questions.	First offence attracts rustication for two (2) semesters. Repeat of same offence/misconduct attracts expulsion.
6	Forging, altering or presenting medical report in order to obtain deferment of an examination or any other benefit.	The culprit will face the Student Disciplinary Committee.
7	Lobbying for examination grades by whatever means.	The culprit will face the Student Disciplinary Committee.

8	Involvement in any other form of cheating or other acts intended to confer undue advantage on the student.	Rustication for two (2) semesters. Expulsion at the repeat of the offence.
9	Aiding, abetting or covering examination misconduct by any student.	Rustication for two (2) semesters. Expulsion at the repeat of same misconduct.
10	Refusal to make a written statement or sign any of the materials to be used as exhibits in support of any examination misconduct.	First offence attracts rustication for two (2) semesters. Repeat of same offence/misconduct attracts expulsion.
11	Refusal to appear before an examination misconduct or malpractice committee/panel.	Expulsion from the University
12	Smuggling of examination question paper out of the examination hall / room while the examination is in progress.	Expulsion from the University
13	Refusal to hand over suspected / incriminating materials.	First offence attracts rustication for two (2) semesters. Repeat of same offence/misconduct attracts expulsion.
14	Destruction of suspected / incriminating materials.	First offence attracts rustication for two (2) semesters. Repeat of same offence/misconduct attracts expulsion.
15	Failure to return an answer script after an examination.	Rustication for two (2) semesters. Expulsion at the repeat of the offence.
16	Writing before the order to begin or after the student has been ordered to stop writing.	The Supervisor should deduct the 10marks and report this action formally. Thereafter, the Supervisor should transmit the answer script to the Examination Malpractice Committee.
17	Verbal Assault on an Invigilator/Supervisor.	Rustication from the University for two (2) semesters.
18	Physical Assault on an Invigilator /Supervisor.	Expulsion from the University.
19	Running out of the examination hall after being apprehended for any examination offence.	Rustication from the University for two (2) Semesters.
20	Possession of weapon(s) inside the examination hall/ room.	Expulsion from the University.

5.2 Regulations Governing University Examinations/Sanctions

Students are obliged to adhere to following regulation governing the conduct of the university examination as detailed in the Students' Information Handbook approved by University Senate.

1. Students shall use their University registration number as their examination numbers. Their name shall not be written on the answer booklets/scripts.

2. Students shall normally enter the examination hall/room with only pen, ink, pencil, rubber (eraser), ruler and any other item that may be permitted for a particular examination.
3. The University shall provide for the students in the examination hall/room, answer booklets including OMR sheet and other approved materials such as drawing paper, square ruled paper, graph paper, logarithm tables, etc. as may be approved to be provided for the examination.
4. Each answer booklet shall be serially numbered and validated by the Registrar's office and handed to the students or placed on the student's desks in the examination halls/room by the invigilators.
5. Whenever a student in any University examination, on medical grounds, desires to use a Computer or dictate his answers, the Dean of the College shall, after consultation with the Director of Medical Services of the University, arrange for the typing or dictation of his answers under supervision at the student's expense.
6. Students should not bring into the examination hall/room, any unauthorized book/papers/notes/manuscripts, gadgets equipment or other extraneous materials. Any student in possession of such items should either deposit them with the invigilator or leave them outside the examination hall/room.
7. Every student must fill and sign the Examination Attendance Register for each examination before leaving the examination hall/room.
8. Instructions to students may be written on the board when necessary.
9. Questions in examination papers shall remain as they are irrespective of any error, students may have observed in the paper until there is instruction to the contrary by the invigilator.
10. Students shall not be allowed to enter the examination or leave hall/room 30 minutes into examination. A student who so decides may leave the Examination Hall any time thereafter. In exceptional cases, a student may be allowed by the Supervisor into examination hall/room after thirty minutes of starting the examination. However, the Supervisor shall report such a case in writing to the Dean of the College offering the course. Such a student may not be allowed any extra time.
11. The time stipulated in the time table for any examination shall be strictly adhered to. Students who enter the examination hall/room late shall not be allowed any extra time.
12. Student shall not remove any question paper from the examination hall/room unless they have completed the examination.
13. Any student desiring to leave the examination hall/room temporarily shall be accompanied by an invigilator.
14. Students shall not write on any other paper other than the answer booklet or other approved materials during an examination. All rough work must be done on the answer booklet and crossed out neatly by the student.
15. At the end of the examinations, all students who took the examination shall remain silent seated until all the answer scripts have been collected by the invigilator. The invigilator shall walk to the student's seat and collect the answer scripts before any student leaves the examination hall/room. On no account shall students walk to the invigilators to hand in their scripts. Any students who is temporarily absent from an examination as a result of illness may be given extra time equivalent to the time lost to complete the examination.
16. Students shall not smoke, eat or drink in the examination hall/room during an examination. (Except under medical recommendation).

5.3 Conflict Resolution

Any student experiencing victimization, extortion, blackmail, threats, or conflicts with another student or University community member, can seek help by following these steps:

1. Approach your Course Adviser to report the issue.
2. If you're not satisfied with the response, escalate the matter to the Head of Department.
3. If still unresolved, take it to the Dean of the College or the Dean of Student Affairs.
4. For issues related to campus life, you may also reach out to the Students' Government, which can assist in resolving the matter with the Dean of Students Affairs.

This process ensures that your concerns are addressed and resolved in a fair and timely manner.

SECTION 6

CURRICULUM

6.1 Curriculum for B. ENG. Degree Programme

Michael Okpara University of Agriculture, Umudike, operates a semester system, where an academic year is divided into two semesters, each lasting fifteen (15) weeks. Students are required to register for approved courses at the beginning of each semester and will be examined in these courses at the end of the semester.

The Bachelor of Engineering (B.Eng.) degree programme in Mechanical Engineering is offered on a full-time basis with a minimum duration ranging from three (3) to five (5) academic years**,** depending on the mode of admission. However, students who fail courses and are required to repeat them may spend a longer period in the programme.

A student is expected to complete the programme within the maximum duration allowed for their mode of admission. If a student exceeds this maximum period, they will be advised to withdraw permanently from the University and will not be permitted to transfer to another programme**.** The allowed duration for completing the B.Eng. degree in Mechanical Engineering is summarized in Table 6.1**:**

Table 6.1 Duration of B.ENG. Degree Programme in Mechanical Engineering, MOUAU

S/No.	Mode of Admission	Minimum Duration (year)	Maximum Duration (year)
1	Candidates admitted into 100 level	5	8
2	Direct Entry Candidates admitted into 200 level	4	6
3	Direct Entry Candidates admitted into 300 level	3	5

6.2 Semester Course Schedule

The B.Eng. Mechanical Engineering programme is structured into semesters**,** with each semester comprising a series of taught courses that students must complete. Each course carries a fixed number of credit units**,** which indicate the academic workload required for the course.

A credit unit is defined based on the type of engagement required:

a) One (1) credit unit is equivalent to:
   i. One (1) hour of lecture (L) per week for a semester, OR
   ii. Two (2) hours of tutorial (T) per week for a semester, OR
   iii. Three (3) hours of fieldwork, laboratory, or workshop practicals (P) per week for a semester.

The semester course schedule includes a combination of lectures, tutorials, and practical sessions designed to provide students with both theoretical knowledge and practical experience necessary for a successful career in mechanical engineering.

6.3 STAFF

Academic Staff

Name: *Ijeoma Francisca IKECHUKWU*
Position: *Senior Lecturer & Ag. HOD*
Qualifications: *BEng, MEng, PhD. (MOUAU)*
Email address: *ikechukwu.francisca@mouau.edu.ng*
Area of Specialization: *Industrial and Systems Engineering.*
Research Focus: *Post-Harvest Machine Design and development, Sustainable Engineering and Technology, Renewable Energy Utilization, and Mechanical Engineering System Optimization.*

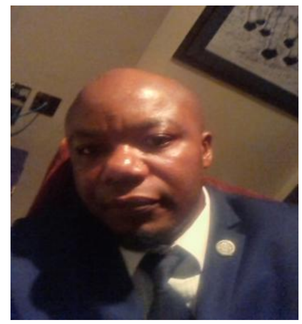
Name: *Anthony Iheanyichukwu OBI*
Position: *Professor*
Qualifications: *B.Eng. (UNIILORIN), MSc., PhD. (ABU)*
Email address: *obi.anthony@mouau.edu.ng*
Area of Specialization: *Design and Production*
Research Focus: *Development and Charactization of Tribological Materials, Application of NDT in corrosion inhibition of subsurface infrastructures, Sourcing alternative materials as lubricants for solid state machining operations.*

Name: *Berthrand Nduka NWANKWOJIKE*
Position: *Professor*
Qualifications: *B.Eng. (FUTO), MEng., PhD. (UNN)*
Email address: *bn.nwankwojike@mouau.edu.ng*
Area of Specialization: *Industrial Engineering and Management*
Research Focus: *Design for Manufacturing & Assembly (DFMA), Product Development and Engineering/Operations Management*
.

Name: CHUKWUMA HENRY KADURUMBA
Rank: Professor
Qualifications: B.Eng. (FUTO), MSc (UI), PhD (UNN)
Email Address: kadurumba.chukwuma@mouau.edu.ng
Area of specialization: Industrial & Production Engineering
Research focus: Industrial & Production Engineering, Environmental Engineering and System Engineering

Name: *Hyginus Ubabuike UGWU*
Position: *Professor*
Qualifications: *B.Eng. (ESUTECH), MEng, PhD (UNN)*
Email address: *ugwu.hyginus@mouau.edu.ng*
Area of Specialization: *Energy & Power Technology*
Research Focus: *Energy systems, sustainability, and renewable energy, with expertise in coal-biodiesel formulation, thermo-fluid studies, mechanical optimization, energy audit, and photovoltaics.*

Name: *Julian Chika ARIRIGUZO*
Position: *Associate Professor*
Qualifications: *B.Eng. (ESUT), MEng, PhD. (Sheffield)*
Email address: *julian.aririguzo@mouau.edu.ng*
Area of Specialization*: Industrial/Production Engineering*
Research Focus: *Design and analysis of newer manufacturing Systems and technology, Renewable/ Green Energy Projects and Sustainable System.*



Name: *Maureen Awele ALLEN*
Position: *Associate Professor*
Qualifications: *B.Eng., MEng, PhD (ESUT)*
Email address: *allen.maureen@mouau.edu.ng*
Area of Specialization:
Research Focus: *Extractive Metallurgy or Chemical Metallurgy, Materials Engineering, Composite Materials, and Biodiesel Production.*

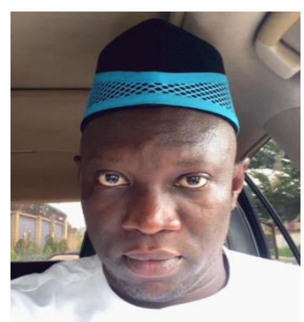
Name: *Dilibe Ifeanyi Ntunde*
Position: *Associate Professor*
Qualifications: *B.Eng. (ESUT), MEng. (TEESSIDE), PhD. (MOUAU)*
Email address: *ntunde.dilibe@mouau.edu.ng*
Area of Specialization: *Energy & Power Engineering*
Research Focus: *Energy and Power Engineering, Mechanical Engineering Systems, Thermofluids, Renewable Energy Efficiency.*

Name: *John Chijioke EDEH*
Position: *Senior Lecturer*
Qualifications: *B.Eng. (NAU), MEng. (UNN), PhD. (MOUAU)*
Email address: *edeh.john@mouau.edu.ng*
Area of Specialization: *Design and Production Engineering*
Research Focus: *Design and Development of Machineries and Processing Technologies, Modelling and Systems Optimization, Sustainable Material Development.*
Renewable Energy

Name: *Cyril Anosike AMAGHIONYEODIWE*
Position: *Senior Lecturer*
Qualifications: *B.Eng., MEng. (UI), PhD. (MOUAU)*
Email address: *Amaghionyeodiwe.cyril@mouau.edu.ng*
Area of Specialization: *Industrial and Systems Engineering*
Research Focus: *Sustainable, Renewable, and Alternative Energy, Environmental engineering, and Systems Analysis.*

Name: *Melford Onyemachi CHIMA*
Position: *Senior Lecturer*
Qualifications: *B.Eng. (NAU), M.Eng. (FUTO), Ph.D. (NAU)*
Email address: *chima.onyemaechi@mouau.edu.ng*
Area of Specialization: *Materials Engineering*
Research Focus: *Material Characterization, Foundry Technology and Refractories, Corrosion Engineering, Heat Treatment Process, and Engineering Material Selection.*

Name: *Chukwunonso Nweze NWOGU*
Position: *Senior Lecturer*
Qualifications: *B.Eng, M.Eng. (MOUAU), Ph.D. (FUTO)*
Email address: *cn.nwogu@mouau.edu.ng*
Area of Specialization: *Automated Design and Manufacturing.*
Research Focus: *Design, Development and Automation of Machines. Modeling and Optimization of Mechanical Systems & Processes. Sustainable materials.*



Name: *Johnson Eze IGWE*
Position: *Senior Lecturer*
Qualifications: *B.Eng., M.Eng. PhD. (MOUAU)*
Email address: *igwe.johnson@mouau.edu.ng*
Area of Specialization: *Energy and Power Engineering*
Research Focus: *Energy & Power Engineering Systems, Design and Development of Energy Plant, Solar Design of Photovoltaic Systems, Renewable Systems Conversion, Energy Efficiency and Conservation.*

Name: *Cyprain C. Ugoamadi*
Position: *Senior Lecturer*
Qualifications: *B.Eng, MEng, PhD (UNN)*
Email address: *ugoamadi.cyprian@mouau.edu.ng*
Area of Specialization: *Industrial Engineering and Management*
Research Focus: *Design and Production, Industrial Engineering and Management.*

Name: *Osinachi Stanley ONWUKA*
Position: *Senior Lecturer*
Qualifications: *B.Eng, MEng. (MOUAU), PhD (UNN)*
Email address: *so.osinachi@mouau.edu.ng*
Area of Specialization: *Design, Production and Materials Engineering*
Research Focus: *Metal Powder Production, Process Optimization, and Design of Alloys for use in advanced deposition and repair system, such as additive manufacturing.*

Name: *Nelson Obinna UBANI*
Position: *Senior Lecturer*
Qualifications: *B.Eng., M.Eng. (NAU), Ph.D. (COOU)*
Email address: *ubani.nelson@mouau.edu.ng*
Area of Specialization: *Materials & Metallurgical Engineering*
Research Focus: *Design and Production Engineering, Engineering Systems Optimization and Modeling, Fluid Pipeline Network Analysis., Industrial and Production Engineering, Materials and Metallurgical Engineering.*

Name: *Daniel Chigaeduzom NNADI*
Position: *Senior Lecturer*
Qualifications: *B.Eng, M.Eng, Ph.D. (MOUAU)*
Email address: *nnadi.daniel@mouau.edu.ng*
Area of Specialization: *Industrial and systems Engineering*
Research Focus: *Design and Production Engineering, Engineering Systems Optimization and Modeling, Industrial and Production Engineering, Materials and Meturgical Engineering.*

Name: *Obuora Anozie OKOYE*
Position: *Lecturer 1*
Qualifications: *B.Eng., M.Eng., PhD. (NAU)*
Email address: *okoye.obuora@mouau.edu.ng*
Area of Specialization: *Design and Production.*
Research Focus: *Design and Production, Solid Mechanics, Composite Technology, Materials Characterization, Corrosion Science, Finite Element Analysis, Modeling and Simulation, Product Development.*

Name: *Onyedikachi Franklin OTI*
Position: *Lecturer 1*
Qualifications: *B.Eng., M.Eng. (MOUAU),*
Email address: *o.oti@mouau.edu.ng*
Area of Specialization: *Design and Production Engineering.*
Research Focus: *Machine design and development, optimization of machines and industrial processes, Machine System Dynamics, and energy efficient solutions.*

Name: *Ekene Clifford IGBOAYAKA*
Position: *Lecturer 1*
Qualifications: *B.Eng,, M.Eng. (MOUAU)*
Email address: *igboayaka.ekene@mouau.edu.ng*
Area of Specialization: *Industrial and Systems Engineering.*
Research Focus: *Design and Development of Machines, Optimization of Mechanical/Industrial Systems and Processes.*

Name: *Stella Ngozi ENI-IKEH*
Position: *Lecturer 1*
Qualifications: *B.Eng. (ESUT), PGD, M.Eng. (UNIPORT),*
Email address: *eni-ikeh.stella@mouau.edu.ng*
Area of Specialization: *Industrial Production*
Research Focus: *Industrial engineering, optimization, quality, ergonomics, sustainability, and lean manufacturing.*

Name: *Chibuzo OKORO*
Position: *Lecturer 11*
Qualifications: *B.Eng., MEng, (FUTO),*
Email address: okoro.chibuzo@mouau.edu.ng
Area of Specialization: *Energy and Power Engineering.*
Research Focus: *Energy and Power System Design and Modelling with emphasis on built environments, Optimization of Energy and power systems.*

Name: *Bright Ikechukwu SIMEON*
Position: *Lecturer 11*
Qualifications: *B.Eng., MEng. (MOUAU)*
Email address: *Simeon.bright@mouau.edu.ng*
Area of Specialization*:* *Mechanical and Materials Engineering*
Research Focus: *Computational Modelling*

Name: *Clifford OMONINI*
Position: *Graduate Assistant*
Qualifications: *B.Eng. (MOUAU), MSc.*
Email address: *omonini.clifford@mouau.edu.ng*
Area of Specialization:
Research Focus: *Manufacturing Engineering, Material science, Computational mechanics, Design and product development.*

6.3.2 Technical Staff

Ugochukwu OKENWA
Chief Technologist
HND, M.Eng.

Nkemakolam G. ORJI
Assistant Chief Technologist
B.Eng., M.Eng.

Chinonyerem E. CHILAKA
Assistant Chief Technologist
HND, M.Eng.

Kenneth N. UJOATUONU
Assistant Chief Technologist
HND, M.Eng.

Uduma Inya OKORO
Principal Technologist 1
HND, M.Eng., Ph.D.

Vivian C. ANYAEGBU
Principal Technologist
B.Eng, PGD.

Samuel E. NWANKWO
Senior Technical Officer
HND

Table 6.2: Developed course outline for B.Eng. Mechanical Engineering Michael Okpara University of Agriculture Umudike

Level	*GSS/GNT*	*Basic Science*	*Discipline/ ENG*	*Programme (MEE)*	*SIWES*	*Total Units*
100	13	26	3	-	-	**42**
200	6	11	27	-	1	**44**
300	2	-	4	38	1	**44**
400	2	-	3	17	15	**37**
500	-	-	-	38	-	**38**
Total	**23**	**37**	**37**	**93**	**15**	**205**

6.4 BMAX-Course Listing

FIRST YEAR

FIRST SEMESTER

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

SECOND SEMESTER

COURSE CODE	COURSE TITLE	CREDIT LOAD
Major Courses		
ENG 121	Computer Applications and Information Technology	2
Auxiliary Courses		
MTH 122	Elementary Mathematics II	3
MTH 123	Introduction to Vectors	2
PHY 121	General Physics II	2
PHY 122	Elementary Physics II	2
PHY 127	Physics Lab II	1
CHM 121	General Chemistry II	3
CHM 124	Practical Chemistry II	1

General Studies Courses

GSS 121	Use of English II	2
GSS 124	Elementary French II	1
GSS 125	Basic German II	1
GSS 126	Social Science	2
Total		**22**

SECOND YEAR

FIRST SEMESTER

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

SECOND SEMESTER

COURSE CODE	COURSE TITLE	CREDIT LOAD
Major Courses		
ENG 221	Strength of Materials I	2
ENG 222	Engineering Drawing II	2
ENG 223	Computer Programming	3
ENG 224	Materials Science	2
ENG 225	Fluid Mechanics I	2
ENG 226	Engineer in Society	1
ENG 200	Student Work Experience Programme (SWEP I)	1
EME 229	Fluid Mechanics Laboratory	1
EME 220	Material Science Laboratory	1
Auxiliary Courses		
MTH 221	Mathematical Methods II	3
STA 224	Statistics for Physical Science & Engineering	3
General Studies Courses		
GNT 221	Entrepreneurial Studies	2
Total		**23**

THIRD YEAR

FIRST SEMESTER

COURSE CODE	COURSE TITLE	CREDIT LOAD
ENG 313	Engineering Analysis	3
EME 311	Mechanics of Machines	2
EME 312	Workshop Practice 11	2
EME 314	Mechanical Engineering Design 1	3
EME 315	Strength of Materials11	2
EME 316	Engineering Drawing I11	2
EME 317	Electromechanical Systems	3
EME 318	Fluid Mechanics 11	2
EME 319	Automotive Workshop Technology	1
GNT 311	Business Development and Management	2
	Total	**22**

SECOND SEMESTER

COURSE CODE	COURSE TITLE	CREDIT LOAD
ENG 326	Technical Report Writing and Presentation	1
EME 321	Engineering Thermodynamics 11	2
EME 322	Manufacturing Technology	2
EME 323	Measurement and Instrumentation	3
EME 324	Engineering Metallurgy 1	2
EME 325	Machine Systems Dynamics	2
EME 326	Automotive Workshop Technology 11	1
EME 327	Computer Aided Design and Manufacture (CAD/CAM)	2
EME 328	Production Planning and Control	2
EME 329	Mechanics of Machines 11	2
EME 320	Mechanical Engineering Laboratory	3
ENG 300	Students' Work Experience Programme (SWEPII)	1
	Total	**23**

FOURTH YEAR

FIRST SEMESTER

COURSE CODE	COURSE TITLE	CREDIT LOAD
ENG 418	Computational Methods in Engineering	3
EME 411	Applied Thermodynamics	2
EME 412	Engineering Metalurgy 11	2
EME 414	Mechanical Engineering Design 11	3
EME 415	Heat and Mass Transfer	3
EME 416	Applied Fluid Mechanics	2
EME 417	Productivity and Technology Development	2
EME 410	Mechanical Engineering Laboratory 11	3
GNT 411	Practicum	2
	Total	**22**

SECOND SEMESTER

COURSE CODE	COURSE TITLE	CREDIT LOAD
ENG 400	Student Industrial Work Experience Scheme (SIWES)	**15**

FIFTH YEAR

FIRST SEMESTER

COURSE CODE	COURSE TITLE	CREDIT LOAD
EME 511	Engineering Management	3
EME 512	Refrigeration and Air conditioning	3
EME 514	Mechanical Engineering Design 111	3
EME 515	Engineering Material Selection and Economics	3
EME 516	Automatic Control	3
EME 517	Engineering Law	2
EME 500	B.ENG. Degree Project	3
	Total	**20**

SECOND SEMESTER

COURSE CODE	COURSE TITLE	CREDIT LOAD
EME 521	Theory of elasticity and Plasticity	3
EME 524	System Engineering	3
EME 500	B.ENG. Degree Project	3
EME 5XX	*Three (3) Electives Courses from one or more of the under Listed areas (3 Credits each)*	9
	Total	**18**

ELECTIVES

ENERGY AND POWER ENGINEERING OPTION

COURSE CODE	COURSE TITLE	CREDIT LOAD
MEE 521	Energy Conversion Principles	3
MEE 522	Power Plant Engineering	3
MEE 523	Fundamental of Nuclear Engineering	3

MEE 524	I.C. Engines Performance and Evaluation	3
MEE 525	Engineering Thermodynamics 111	3

INDUSTRIAL AND PRODUCTION ENGINEERING OPTION

COURSE CODE	COURSE TITLE	CREDIT LOAD
MEC 521	Manufacturing and Tools Engineering	3
MEC 522	Quality and Reliability Engineering	3
MEC 523	Simulation in Engineering	3
MEC 524	Facilities Design and Safety Engineering	3
MEC 525	Finite Element Analysis	3
MEC 526	Mechatronics Engineering	3

Table 6.3: Programme/Sub-Discipline/Discipline Workload by Students.

FIRST YEAR – FIRST SEMESTER

Grouping	*Course No*	*Course subject*	*Pre-requisite Courses*	*Contact Hour Per Week*			*Total week load*
				L	**T**	**P**	
(a) General studies Courses; e.g. Humanities, Communication and social sciences.	GSS 111	Use of English I	-	2	-	-	2
	GSS 112	Nigerian History	-	1	-	-	1
	GSS 116	Use of Library	-	1	-	-	1
	GSS 114	Elementary French I	-	1	-	-	1
	GSS 115	Basic German I	-	1	-	-	1
	UGC 111	Farm practice	-	-	-	3	3
(b) Core/compulsory courses	ENG 111	Introduction to Engineering	-	1	-	-	1
	MTH 112	Elementary mathematics I	-	2	1		3
	PHY 111	General physics I	-	2	-	-	2
	PHY 112	Elementary physics I	-	2	-	-	2
	PHY 117	General physics Lab. I	-	-	-	3	3
	CHM 113	General Chemistry I	-	2	1	-	3
	CHM 114	Practical chemistry I	-	-	-	3	3
	MTH 111	General Mathematics I	-	2	1	-	3
(c). Electives/ optional			-	-	-	-	-
	Total			***16***	***3***	***9***	***28***

FIRST YEAR – SECOND SEMESTER

Grouping	**Course No**	**Course subject**	**Pre-requisite Courses**	**Contact Hour Per Week**			**Total week load**
				L	**T**	**P**	
(a.) General studies courses, e.g. humanities, communication and social sciences.	GSS 121	Use of English I	-	2	-	-	2
	GSS 124	Elementary French II	-	1	-	-	1
	GSS 125	Basic German II	-	1	-	-	1
	GSS 126	Social science	-	2	-	-	2
(b) Core/Compulsory Courses	MTH 122	Elementary mathematics II	-	2	1	-	3
	MTH 123	Introduction to vectors	-	2	-	-	2
	PHY 121	General Physics II	-	2	-	-	2
	PHY 122	Elementary physics II	-	2	-	-	2
	PHY 127	Physical laboratory II	-	-	-	3	3
	CHM 121	General Chemistry II	-	2	1	-	3

	CHM 124	Practical Chemistry II	-	-	-	3	3
	ENG 121	Applied mechanics	-	2	1	-	3
(c) Electives /optional courses			-	-	-	-	-
	Total			18	3	6	27

SECOND YEAR - FIRST SEMESTER

Grouping	Course No/level	Course subject	Pre-requisite	Contact Hour Per Week			Total week load
				L	T	P	
(a). General studies courses e.g. humanities communication and social sciences	GSS 217	Philosophy and logic	-	2	-	-	2
	GSS 212	Peace and Conflict Resolution Studies	-	1	1		2
(b). Core/ compulsory courses	ENG 212	Workshop technology/ Practice	-	1		3	4
	ENG 211	Engineering Thermodynamics 1	-	2	1	-	3
	ENG 214	Engineering Drawing I	-	1	-	3	4
	ENG 213	Basic Electrical Engineering	-	2	1	3	6
	ENG 215	Engineering Mechanics	-	2	-	-	2
	MTH 211	Mathematical methods 1	-	2	1	-	3
	MTH 214	Linear algebra	-	2	-	-	2
c. Electives /optional courses			-	-	-	-	-
	Total			15	4	9	28

SECOND YEAR - SECOND SEMESTER

Grouping	Course No/level	Course subject	Pre-requisite	Contact Hour Per Week			Total week load
				L	T	P	
a. General studies courses e.g. humanities communication and social sciences	GNT 221	Entrepreneurial Studies	-	1		3	4
	ENG 221	Strength of materials 1	-	2	-	-	2
	ENG 222	Engineering drawing II	-	1	-	3	4
	ENG 223	Computer programming	-	1	-	3	4
	ENG 224	Material Science	-	2	1	-	3
	ENG 225	Fluid mechanics I	-	2	1	-	3
	ENG 227	Mechanics of machines I	-	2	1	-	3
	ENG 226	Engineer in Society	-	1	-	-	1
	MTH 221	Mathematical methods II	MTH 211	2	1	-	3
	STA 224	Statistics for physical Science and engineering	-	2	1	-	3
	EEE 221	Basic Electrical Engineering Lab	-			3	3
	ENG 200	200 Level Students Industrial Work Experience (3 Months)	-	-	-	-	-
Electives /optional			-	-	-	-	-
	Total			16	5	12	33

THIRD YEAR - FIRST SEMESTER

Grouping	Course No/level	Course subject	Pre-requisite Courses	Contact Hour Per Week			Total week load
				L	T	P	
Core/ compulsory courses	ENG 313	Engineering Analysis	-	3	1	-	4
	EME 311	Mechanics of Machines 1	ENG 215,	2	1	-	3
	EME 312	Workshop Practice 11	ENG 212	2	1	3	5
	EME 314	Mechanical Engineering Design 1	-	3	-	-	3
	EME 315	Strength of Materials 11	ENG 221	3	1	-	4
	EME 316	Engineering Drawing 111	ENG 214, ENG 222	1	-	3	4
	EME 317	Electromechanical Systems	-	2	-	2	4
	EME 318	Fluid Mechanics 11	ENG 225	2	1	-	3
	EME 319	Automotive Workshop Technology 1	-	2		2	4
	GNT 311	Business Development & Management	GNT 221	2	1	-	3
Elective/Optional Courses			-	-	-	-	-
	Total						38

THIRD YEAR – SECOND SEMESTER

Grouping	Course No/level	Course subject	Pre-requisite Courses	Contact Hour Per Week			Total week load
				L	T	P	
	ENG 326	Technical report Writing and Presentation	-	1	1	-	2
Core/compulsory Courses	EME 321	Engineering Thermodynamics 11	ENG 211	2	1	-	3
	EME 322	Manufacturing Technology	-	3	1	-	4
	EME 323	Measurement and Instrumentation	-	2	1	-	3
	EME 324	Engineering Metallurgy I	ENG 224	3	-		3
	EME 325	Machine System Dynamics	EME 311			2	2
	EME 326	Automotive Workshop Technology 11	EME 319	3	1	-	4
	EME 327	Computer Aided Design and Manufacture (CAD/CAM)	EME 316	3	1		4
	EME 328	Production planning and control	-	2	-		2
	EME 329	Mechanics of Machines 11	EME 311				
	EME 320	Mechanical Engineering Laboratory 1	EME 311, EME 315, EME 317, EME 323, EME 324, EME 325, EME 329			3	3
	ENG 300	300 Level Students Industrial Work Experience Scheme (3 Months)	ENG 200	-	-	-	1
Electives/Optional Courses			-	-	-	-	-
	Total						31

FOURTH YEAR – FIRST SEMESTER

Grouping	Course No/level	Course subject	Pre-requisite Courses	Contact Hour Per Week			Total week load
				L	T	P	
Core/compulsory courses	ENG 418	Computational Methods in Engineering	ENG 313	3	1	-	4
	GNT 411	Practicum	-	2	-	-	2
	EME 411	Applied thermodynamics	EME 324	2	1	-	3
	EME 412	Engineering Metallurgy 11	EME 324	3	1	-	4
	EME 414	Mechanical Engineering Design 11	EME 314	2	1	-	3
	EME 415	Heat and Mass Transfer	-	2	1	-	3
	EME 416	Applied Fluid Mechanics	EME 318	2	1	1	4
	EME 417	Productivity and Technology Development	EME 328	2	1	-	3
	EME 410	Mechanical Engineering Laboratory	ENG 211, EME 318, EME 321,	-	-	3	3
	GNT 411	Practicum	-	1	1	-	2
	Total						32

FOURTH YEAR – SECOND SEMESTER

Grouping	Course No/level	Course subject	Pre-requisite Courses	Contact Hour Per Week			Total week load
				L	T	P	
Core/compulsory courses	ENG 400	Students Industrial Work Experience Scheme (SIWES)	ENG 300	-	-	-	15
	Total		-	-	-	-	15

FIFTH YEAR - FIRST SEMESTER

Grouping	Course No/level	Course subject	Pre-requisite Courses	Contact Hour Per Week			Total week load
				L	T	P	
Core/compulsory courses	EME 511	Engineering Management	EME 417	3	1	-	4
	EME 512	Refrigeration and Air Conditioning	EME 321, EME 411	3	1	-	4
	EME 514	Mechanical Engineering Design 111	EME 414	3	1	-	3
	EME 515	Engineering Material Selection and Economics	EME 324	3	1	-	3
	EME 516	Automatic Control	EME 323	3	1	-	3
	EME 517	Engineering Law	-	2	-	-	2
	EME 500	B.ENG. Degree Project	-			3	3
Electives/Optional							
	Total						22

FIFTH YEAR - SECOND SEMESTER

Grouping	Course No/level	Course subject	Pre-requisite Courses	Contact Hour Per Week			Total week load
				L	T	P	
Core/compulsory courses	EME 521	Theory of Elasticity and Plasticity	ENE 321	3	1	-	4
	EME 524	System Engineering	-	3	1	-	4
	EME 500	B.ENG. Degree Project	-	3	-	3	6

	EME 5XX	*Three (3) Electives Courses from one or more of the under Listed areas (3 Credit each)*	-	2	1	-	3
Electives/Optional			-		-	-	
	Total						**17**

ELECTIVES: ENERGY AND POWER ENGINEERING OPTION

Course No/level	Course subject	Pre-requisite Courses	Contact Hour Per Week			Total week load
			L	**T**	**P**	
MEE 521	Energy Conversion Principles	-	3	1	-	4
MEE 522	Power Plant Engineering	-	3	1	-	4
MEE 523	Fundamental of Nuclear Engineering	-	3	-	-	3
MEE 524	I.C. Engines Performance and Evaluation	-	2	1	-	3
MEE 525	Engineering Thermodynamics 111	-		-	-	
Total						**14**

ELECTIVES: INDUSTRIAL AND PRODUCTION ENGINEERING OPTION

Course No/level	Course subject	Pre-requisite	Contact Hour Per Week			Total week load
			L	**T**	**P**	
MEC 521	Manufacturing and Tool Engineering	-	3	1	-	4
MEC 522	Quality and Reliability Engineering	-	3	1	-	4
MEC 523	Simulation in Engineering	-	3	-	2	5
MEC 524	Facilities Design and Safety Engineering	-	2	1	-	3
MEC 525	Finite Element Analysis	-		-	-	
MEC 526	Mechatronic Engineering					
Total						**16**

6.5 Course Contents and Learning Outcomes

ENG 111: Introduction to Engineering **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the historical development of engineering and technology.
2. Identify the various fields of engineering and their applications in society.
3. Explain the role of renewable and non-renewable resources in engineering.
4. Analyze the environmental impacts of engineering materials such as plastics and chemicals.
5. Demonstrate knowledge of scientific methodology and its relevance in engineering.

History- Engineering and Technology: Man-his origin and nature; man and his economic environment; scientific methodology; science and technology in the society and service of man. Renewable and non-renewable resources: Man and his energy resources. Environmental effects of chemicals, plastics, textiles, wastes and other materials. Chemical and radio-chemical hazards. Introduction to the various areas of Engineering.

MTH 112: Elementary Mathematics I **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:
1. Apply elementary set theory concepts such as union, intersection, and complements.
2. Solve polynomial equations using remainder and factor theorems.
3. Analyze sequences and series, including arithmetic and geometric progressions.
4. Utilize De Moivre's theorem to solve complex number problems.
5. Perform matrix operations, including determinants and inverse calculations.

Algebra and trigonometry: Elementary set theory, sets, union, intersection, complements, and Venn diagrams. Real numbers: integers, rational and irrational numbers, polynomials, remainder and factor theorems, polynomial equations and inequalities, primarily linear, quadratic and cubic. Domain and zeros of rational functions. Binomial theory for any index. Real sequences and series, arithmetic and geometric progressions, limits and sums to infinity. Complex numbers, algebra of complex numbers. Argand diagram, De Moivre's theorem, the n-th root of unity. Trigonometry functions of angles, trigonometric equations such as $a\cos\theta + b\sin\theta = C$. Matrices: introduction to matrices, elementary operations on matrices, determinants of at 3 x 3 matrices.

PHY 111: General Physics I **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:
1. Demonstrate an understanding of fundamental and derived physical units.
2. Apply vector analysis to solve problems in mechanics.
3. Analyze motion, including kinematics, circular motion, and simple harmonic motion.
4. Apply Newton's laws of motion to real-world problems.
5. Explain fluid mechanics concepts such as Archimedes' principle and fluid pressure.

Relevance of physics to agriculture. Fundamental and derived units. Use of measuring instruments. Vectors, addition and subtraction of vectors. Resolution of vectors. Scalar and product vectors. Graphs, error analysis and precautions in experimental physics. Equilibrium. The principles of moments. Centre of gravity and its application in agriculture. The cantilever, kinematics, displacement, velocity and acceleration. Projection motion, circular motion, and simple harmonic motion. The pendulum. Dynamics: newton laws of mechanics. Elastic and inelastic collision. Modulus of elasticity. The spiral spring: static and kinetic friction, inertia, torque. The density of the solid. Properties of matter. Archimedes' principle. Fluid pressure, blood pressure. The density of a liquid.

PHY 112: Elementary Physics I **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:
1. Understand the basic principles of space and time in physics.
2. Apply Newtonian mechanics to analyze motion and forces.
3. Explain the fundamental laws of thermodynamics and their applications.
4. Analyze fluid properties, including viscosity, surface tension, and buoyancy.
5. Solve problems involving work, energy, and momentum conservation.

Space and time, frame of reference, units and dimension; kinematics, fundamental laws of mechanics, statics and dynamics; Galilean invariance, universal gravitation, work and energy, rotational dynamics and angular momentum, conservation laws. Molecular treatment of properties of matter. Elasticity, Hooke's law, Young's, shear and bulk moduli; hydrostatics, pressure, buoyancy, Archimedes' principles. Hydrodynamics, streamlines, Bernoulli and continuity equations, turbulence, Reynolds number. Viscosity, laminar flow, Poiseuille's equation. Surface tension, adhesion, cohesion, capillarity, drops and bubbles.

PHY 117: General Physics Laboratory I **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Perform accurate quantitative measurements in physics experiments.
2. Analyze and interpret measurement errors.
3. Use graphical methods for data analysis and representation.
4. Demonstrate proper handling and operation of laboratory equipment.
5. Apply experimental techniques to verify principles taught in PHY 111 and PHY 112.

This introductory course emphasizes quantitative measurements, the treatment of measurement errors, and graphical analysis. Various experimental techniques and methods will be applied in the measurement and error treatment of physical quantities—experimental treatment of topics taught in PHY 111 and PHY 112.

CHM 113: General Chemistry I **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand atomic structure and chemical periodicity.
2. Apply stoichiometric principles to balance chemical equations.
3. Analyze reaction kinetics and electrochemical processes.
4. Explain the principles of chemical bonding and molecular structure.
5. Demonstrate an understanding of radioactivity and nuclear chemistry.

Atoms, molecules and chemical reactions, chemical equations and stoichiometry, atomic structure and periodicity, modern electric theory of atoms, radioactivity, chemical kinetics, electrochemistry.

CHM 114: Practical Chemistry I **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Follow laboratory safety procedures and protocols.
2. Identify and use various chemistry laboratory equipment.
3. Conduct qualitative and quantitative chemical analyses.
4. Perform volumetric and titrimetric experiments accurately.
5. Record and analyze experimental data systematically.

Introduction to chemistry laboratory, safety precautions, equipment, qualitative inorganic analysis, chemical methods or volumetric analysis.

GSS 111: Use of English I **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Develop effective listening comprehension skills.
2. Apply proper grammar and sentence structure in writing.
3. Improve reading comprehension and summarization skills.

4. Utilize effective note-taking techniques during lectures.
5. Understand the fundamentals of research writing and referencing.

Listening comprehension; distraction, note-taking techniques during lectures, aids to listening comprehensive concentration, signals and cues. Grammar: parts of speech. Sentence types: structure and function, Mechanics of writing: capitalization, punctuation and paragraphing, concord, error identification and correction. Reading comprehension: outline note, summary writing, reading comprehension techniques, scanning, skimming, intensive /extensive reading, and word/text attack skills. Use of library and primary research methods: data collection/analysis process. Research writing: process and techniques, documentation, references, notes and bibliography, abbreviations in research writings and submission of finished research report.

GSS 112: Nigerian History **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the formation and evolution of Nigerian societies.
2. Analyze the impact of colonial rule on Nigeria.
3. Evaluate the role of nationalism in Nigeria's independence movement.
4. Examine Nigeria's foreign policy and international relations.
5. Assess the impact of political changes on contemporary Nigeria.

Pre-colonial Nigeria - Nigeria up to 1800, formation of human societies and ancient civilizations, aspects of cultural history; the centralized states of Nigeria up to 1800-Kanem and Borno, Hausa, Nupe, Jukun, Oyo, Benin, Efik, and non-centralized states of Nigeria: Igbo, Ibibio, Urhobo, Isoko etc - group relations, Nigeria's early contact with the outside world, Islamic, Christianity and the trans-Atlantic slave trade, The establishment of the Sokoto Caliphate, changing nature of European relations and the British conquest. Colonial Nigeria - The early phase of the British rule 1900 -1914, indirect rule in Nigeria. Colonial rule and its impact on Nigeria, the decolonization process in Nigeria 1922 - 1960, constitutional development, Nationalism and struggle for independence. Post-Colonial Nigeria - Nigeria since independence, Trials and tribulations of Nigeria changes and continuities, Nigeria's international Relations and foreign policy.

GSS 114: Elementary French 1 **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Identify francophone countries and their cultural significance.
2. Utilize basic French vocabulary for greetings and introductions.
3. Understand fundamental French grammar and sentence structures.
4. Construct simple French sentences for daily communication.
5. Develop listening and pronunciation skills in French.

Connaissance de la France, les pays francophones et leurs capitals - Pourquoi le francais au Nigeria? La contribution de la France dans le development de l'Agriculture, de la Science et Technologie en dehor de la philosphie, arts et politique international. L'alphabet francais (voyelles et consonnes), Introduction a' la phonetique, Exercises en orthograhie, dire le mot epele, dire des abbreviations et le code des cours. Les salutations quotidiennes, usuelles et occasionnelles anisi que les formules de politesse. Questions / response pour eliciter des renseignements sur un individu (nom, age, profesion, nationalite, domicile, date et lieu de nassance). Se presenter et presenter quelqu'un d'autre. Les professions ou metiers. "Qui est-ce? C'est..." Les numbers cardinaux et ordinaux (de zero a milliard), Application pour donner un numero ded telephone, son numero d' immatriculation, le numero d' une maison dans une rue etc. Dire l'heure ("Quelle heure est-il?" - "il est...heures") et la dae (les jours et les mois. Les objets utilizes en classe, a' l'ecole. Question du type "Qu'est-ce que c'est? et reponse. Question du type "Est-ce c'est un / une-...?/Est-ce4 ce sont des...?", responses a'I'AFFIRMAFIFETAU NEGATIF... Les articles indefinis et defines au singulier et au pluriel. Le pluriel des noms. Less prepositions: sur, sous, dans, devant, derriere, a cote de. Question "Qu est.../Qu'sont...?"

GSS 115: Basic German I **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Pronounce German vowels, consonants, and diphthongs accurately.
2. Differentiate between strong, weak, and auxiliary verbs.
3. Conjugate common German verbs in present and past tenses.
4. Apply definite and indefinite articles correctly in German.
5. Construct simple sentences using German pronouns and adjectives.

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

GSS 116: Use of Library **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the history and importance of libraries.
2. Differentiate between types of libraries and their functions.
3. Utilize library cataloging systems for research.
4. Identify credible sources and reference materials.
5. Apply citation and referencing techniques to academic work.

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

UGC 111: Farm Practice I **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the principles of farm planning and structure.
2. Identify site selection criteria for agricultural projects.
3. Develop layouts for farm structures, roads, and fences.
4. Apply knowledge of soil and crop management techniques.
5. Perform basic farm operations and maintenance.

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

ENG 121: Computer Applications and Information Technology 2 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the fundamental concepts of computer applications.
2. Utilize spreadsheet software for data processing and analysis.
3. Apply PowerPoint for effective presentations.
4. Use computer simulation software for solving mathematical problems.
5. Understand basic concepts of network security and management information systems.

Computer applications overview. Data processing applications and computations involving spreadsheet programmes (Microsoft Excel), Power point etc. Introduction to computer simulation software. Use of computer for solving mathematical problems. Management Information System and Networks: information Technology, network securities etc.

MTH 122: Elementary Mathematics II 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the concept and notation of functions.
2. Differentiate algebraic, trigonometric, and exponential functions.
3. Apply integration techniques such as substitution and partial fractions.
4. Solve real-world problems using maxima, minima, and curve sketching.
5. Evaluate definite and indefinite integrals and their applications.

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

MTH 123: Introduction to Vectors 2 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand vector representation in one, two, and three dimensions.
2. Apply vector algebra laws in solving mathematical problems.
3. Compute scalar and vector products and their applications.
4. Solve kinematics problems using vector methods.
5. Analyze geometric properties of lines, circles, and conic sections using vectors.

Equations of straight lines, circles, ellipse, parabola and hyperbola. Tangents and normal. Vectors: the law of vector algebra. Representation of vectors in 1-3 dimensions. Components and direction cosines. Addition of vectors and multiplication of vectors by scalars, scalar and vector products of two vectors, triple products. Application of vectors to geometry and kinematics of particle, including relative velocity.

PHY 121: General Physics II **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the principles of wave dynamics and the wave equation.
2. Analyze sound waves and Doppler effects.
3. Explain electrostatic forces and Coulomb's law.
4. Apply concepts of electric circuits, magnetism, and alternating current.
5. Understand the principles of heat transfer and thermodynamics.

Waves; dynamics of waves. The wave equation, characteristics of waves, stationary waves, light waves and their characteristics. Imaging, sound wave. Doppler effects. The converging lens. Refraction at plane surfaces. Electricity: electrostatic force. Coulomb's law, electric field and electric potential. Ohm's law, alternating current. Magnetism: magnetic effects of current. Permanent magnetism. Para-, Dia-, and Ferro- magnetism. Faraday's laws of induction. The potentiometer and Wheatstone bridge. Concept of heat: temperature and thermometers.

PHY 122: Elementary Physics II **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the fundamental principles of electrostatics.
2. Apply Maxwell's equations to analyze electromagnetic waves.
3. Solve problems related to thermodynamics and general gas laws.
4. Explain the behavior of conductors and dielectrics in electric fields.
5. Analyze the motion of charged particles in magnetic fields.

Electrostatics, conductors, currents, dielectrics, magnetic fields and induction, Maxwell's equations, electromagnetic oscillations and waves, application. General gas laws, laws of thermodynamics. Kinetic theory of matter (gases) and postulates of kinetic theory. Applications

PHY 127: Physics Laboratory II **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Perform experiments related to electricity, magnetism, and wave mechanics.
2. Apply experimental techniques in measuring physical quantities.
3. Analyze and interpret experimental data systematically.
4. Understand the principles of error analysis in laboratory work.
5. Correlate practical observations with theoretical concepts.

Various experimental techniques and methods will be applied in the measurement and error treatment of physical quantities based on topics taught in PHY 121 and PHY 122.

CHM 121: General Chemistry II **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the classification and nomenclature of organic compounds.
2. Explain the periodic properties of elements and their applications.
3. Analyze chemical bonding and molecular structure.
4. Apply principles of organic chemistry in compound synthesis.

5. Understand the qualitative analysis of selected metals and non-metals.

Historical survey of the development and importance of organic chemistry, nomenclature and classes of organic compounds, homologous series, functional groups isolation and purification of compounds, electronic theory in organic chemistry, saturated hydrocarbons, unsaturated hydrocarbons, periodic table and periodic properties, valence forces, the structure of solids, the chemistry of selected metals and non-metals, qualitative analysis.

CHM 124: Practical Chemistry II **1 Unit**
Learning Outcomes:
Upon completing this course, students will be able to:
1. Perform qualitative and quantitative analysis of organic compounds.
2. Apply laboratory techniques in the purification of compounds.
3. Conduct experiments on functional groups in organic chemistry.
4. Understand thin-layer chromatography for chemical analysis.
5. Perform tests on alcohols, aldehydes, ketones, and esters.

Introduction, stoichiometry, chemical arithmetic, identification of organic functional groups, recrystallization, melting point determination, simple and functional distillation. The preparation and reactions of alkene, propanol and the formation of hydrazone, identification tests on alcoholics, aldehydes and ketones, amines, phenols and esters, preparation of aspirin, saponification, and osazone formation. Thin layer chromatography.

GSS 121: Use of English II **2 Units**
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand the nature, style, and purpose of different types of writing.
2. Apply grammar rules to improve written communication.
3. Write and format formal and informal letters.
4. Develop report-writing skills for investigative and technical purposes.
5. Improve oral communication skills, including pronunciation and stress patterns.

Grammar: language and communication, varieties of speech, direct and reported speech, homonyms, synonyms and homophones/word choice usage, error identification and correction. Writing: nature, style and purpose, varieties of writing including form, style and language, formal and informal letter writing, memorandum, description, narration, exposition, argumentation. Report writing - types and language forms: investigative, editorial, medical, valuation, feasibility studies, technical/scientific reports and book reviews. Oral Communication: Definition of phonology, classification and articulation of the sound system of English, transcription and pronunciation, stress and intonation patterns: speech-making and presentation.

GSS 124: Elementary French II **1 Unit**
Learning Outcomes:
Upon completing this course, students will be able to:
1. Conjugate commonly used French verbs in different tenses.
2. Construct sentences using possessive adjectives.
3. Describe daily life activities in French.
4. Apply prepositions correctly in sentence construction.

5. Develop listening and speaking proficiency for simple conversations.

Introduction aux verbs les plus usages chaque jour: Conjugaisons au present (affirmative, Interrogatif, et negative) ETRE, AVOIR, ALLER, ECOUTER, REGARDER, ETUDIER, MANGER, etc. Construction des phrases: ETRE + Nom/Profession/Adiectif Avoir+Age/un Object/un sentiment (faim, soif, chaud, froid, sommeil, mal etc). Aller + lieu (en employant l'articulate contracte:a, au, a la, a' l'aux) / Verbe a'Infinitif. AIMER + Quelqu'un(e)/Quelque chose/Verbe a'Infitif. Descriptionde la vie (activities) quotidienne, Les adjectives possesifs + members de la famile, ami(e), comrade, professuer etc. Less possessives avec objets. Question/response du type "A qui est...? /A qui sont...?

GSS 125: Basic German II **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand and use common verbs in different tenses.
2. Identify and apply nominative, accusative, and dative cases.
3. Construct simple German sentences using possessive adjectives.
4. Use modal auxiliary verbs in sentence construction.
5. Develop basic conversational skills in German.

She is telling the time. Conjunction of common verbs - gehen, kommen, fahren, leben. Introduction of the cases - nominative, accusative and dative. Colours/simple adjectives, Members of the immediate/extended family. Making simple sentences in German/Introduction of possessive adjectives. Modal auxillaries -- durfen, konnen, mogen, sollen, woollen, & mussen. Conjugation & making of sentences with modal auxiliaries.

GSS 126: Social Science **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the scope and relevance of social sciences.
2. Analyze basic concepts such as culture, norms, and values.
3. Explain globalization and its impact on human development.
4. Understand different economic systems and theories of social change.
5. Examine crime, delinquency, and the criminal justice system.

Introduction to Social Science - Definition and scope of sociology, anthropology, Psychology, political science and Economics, peace and Conflict Studies, International Relations and Diplomacy and Communications. Interrelatedness of these disciplines, Culture and Related Concepts: Definition of basic concepts such as values, norms, subculture, counter culture, ethnocentrisms, folkways, cultural universalism, relativism, ideal and authentic culture. Globalisation and Human Development. Personality and Socialization: Factors in personality development, unique personality experiences, theories of personality, agents of socialization and theories of Socialization. Deviance and Society: Statistical definition, absolute definition, reactive definition, normative definition, sexual deviance, substance abuse, mental disorders, suicide. Crime and Delinquencies: Crime and punishment, theories of crime and delinquency, treatment and the offender, victim's right, grunion criminal justice system, socio-economic costs on society and measure, restriction and control of crime. Economic Systems: Feudalism, capitalism, socialism and communism. Theories of social change. Some Basic

Concepts in Political Science, systems of government, colonialism and political development in third-world countries. Social institutions.

ENG 211: Engineering Thermodynamics I **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the fundamental concepts of thermodynamics.
2. Analyze thermodynamic cycles and their applications.
3. Apply the first and second laws of thermodynamics to real-world problems.
4. Evaluate the efficiency of heat engines and refrigeration systems.
5. Solve problems involving energy conservation and entropy.

Introductory Concepts and Definitions: System and control volume approaches, properties, states, phase equilibrium, processes, cycles. Temperature and Thermodynamic Temperature Scale; Zeroth Law of Thermodynamics. Mechanical energy and work; kinetic, potential and internal energy; displacement and shaft work. First Law of Thermodynamics for a closed system: closed systems and cycles. Properties of Pure substances: the two property rule, state diagrams, intensive and extensive properties, internal energy and enthalpy; phase change, vapour and liquid properties, steam and water. Specific heats, ideal and perfect gases; polytropic processes for ideal gases. The first law for flow processes: Conversion of mass and energy for a control volume; control volume analysis at steady state and application to throttling processes, nozzles, diffusers, turbines, compressors, and heat exchangers. Control volume transient analysis and application to emptying and filling processes. The second law; Clausius statement and Kelvin-Planck statement of second law; reversible and irreversible processes; Application of the second law to thermodynamic cycles; heat engine and efficiency; Kelvin temperature scale and Carnot efficiency, Carnot cycles.

ENG 212: Workshop Technology/Practice I **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Demonstrate safety practices in engineering workshops.
2. Use basic measuring instruments such as calipers and gauges.
3. Understand the working principles of welding, soldering, and brazing.
4. Perform basic woodworking and metalworking operations.
5. Apply engineering principles to the fabrication of mechanical structures.

Industrial safety: safety code of conduct and safety consciousness. Survey of familiar sources of accidents in the workplace. Accident prevention and control. Use of engineering measuring instruments: callipers, gauges. Sheet metal work layout and blacksmithing hand tools, cutting, shaping, welding, brazing, soldering, bolting and riveting and working principles. Joints and fastenings; woodwork: basic woodworking principle and tools. Types of joints, processing of timber. Introduction to industrial bolting and riveting. Safety: a survey of sources of common accidents, accident prevention and control. Introduction to machine shop: lathe work, shaping, milling and grinding. Electrical workshop practice: convention and application of colour, codes for cables, resistors, etc. and signs. Use of simple electrical tools, machines, etc. Measurement and marking: for uniformity, circuitry, concentricity, etc.

ENG 213: Basic Electrical Engineering **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand fundamental electrical and magnetic field concepts.
2. Apply Kirchhoff's laws to analyze DC circuits.
3. Solve AC circuit problems using phasor diagrams.
4. Understand three-phase AC systems and their applications.
5. Analyze power in electrical circuits using complex algebra.

SI Systems of the unit. E.S. and FM Fields: electric field intensity, potential and potential difference, magnetic field intensity, flux and flux density, magnetic circuits, inductors. DC circuit analysis: Kirchoff's law mesh and nodal equations, superposition theorem. Thevenin's theorem, Norton's theorem, maximum power transfer, and transients (RL and RC) circuits. AC circuit analysis: alternating current, voltage, frequency, phase angle, maximum RMS and average values of waveforms. Inductive and capacitive reactance. Power in ac circuits, use of complex algebra in the solution of ac circuit, resonance. Three-phase AC System: three-phase balanced system, delta/star connections, line and phase voltage and currents.

ENG 214: Engineering Drawing I **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the use of engineering drawing instruments.
2. Construct geometric figures and engineering curves.
3. Develop orthographic and isometric projections.
4. Interpret engineering drawings and dimensioning.
5. Apply conventions and symbols in technical drawings.

They were drawing instruments and the use of graphic tools. Introduction to engineering drawing, measuring, lettering and dimensioning of objects in various views/positions. Types of lines and their applications. Engineering Geometry: geometrical construction of parallel and perpendicular lines, bisection and division of lines; construction and bisection of angles; construction of triangles, inscribed, ascribed and circumscribed circles of triangle, quadrilaterals, polygons, circle and geometrical construction on circles including the principle of tangency. Conics and engineering curves: ellipse, parabola, hyperbola, cycloid, trochoid, involutes, simple mechanism etc. Fundamentals of Orthographic Projections, first and third angle orthogonal projections. Isometric projections. Freehand sketching. Symbols and Conventions. Scales.

ENG 215: Engineering Mechanics **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Analyze static and dynamic forces in engineering structures.
2. Solve problems involving Newton's laws of motion.
3. Understand concepts of work, energy, and momentum.
4. Apply equilibrium conditions to rigid bodies.
5. Analyze simple harmonic motion and its applications.

Statics: laws of statics; system of forces and their properties; friction, free body diagrams, equilibrium conditions, vector equations and vector diagrams, simple problems. Particle dynamics: translational and rotation motion, general planar motion, kinematics of plane motion. Laws of motion, Newton's law, kinetics of particles, momentum and energy methods. Kinetics of rigid bodies: two-dimensional motions of rigid bodies, energy and momentum. Mass and moment of inertia. Simple harmonic motions. Static and dynamic forces analysis. Concepts and types of mechanisms: kinematic analysis of mechanism, velocity and acceleration polygons. Static and inertia force analysis of machinery.

MTH 211: Mathematical Methods I **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand functions of multiple variables and their applications.
2. Perform partial differentiation and its applications.
3. Evaluate double and triple integrals for geometric and physical problems.
4. Apply vector calculus to engineering problems.
5. Understand and apply Green's, Stoke's, and divergence theorems.

Real-valued functions of two or three variables, limits and continuity. Partial differentiation: partial derivatives, chain rule, extrema, Lagrange's multipliers, increments, differentials and linear approximations. Multiple integrals: double and triple integrals, iterated integrals, transformation of multiple integrals. Double and triple integrals applications, vector integration and vector integral theorems: divergence Green's - Stoke's theorems and applications. Functions of more than one variable. Extremization of functions of many variables.

MTH 214: Linear Algebra I **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Solve systems of linear equations using matrices.
2. Understand vector spaces and their properties.
3. Compute eigenvalues and eigenvectors of matrices.
4. Perform dot and cross product operations in vector analysis.
5. Apply linear transformations to engineering problems.

Series and tests for convergence if infinite sequences and series of numbers. Equation of lines and planes. Matrices determinants, eigen values and eigen functions, matrix solution of linear algebraic equations, dot and cross product of vectors, triple products, vector functions, the gradient, divergence and curl. Vector spaces over the actual field. Subspaces. Linear dependence and independence (Wronskians and Jacobians). Basis and dimension. Change of basis. Linear transformations and their representation by matrices. Range, null space and rank. Singular and non-singular transformations. Algebra of matrices. Systems of linear equations. Computer solution of matrices.

GSS 217: Philosophy and Logic **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the basic concepts of philosophy and its branches.
2. Differentiate between philosophy, myth, and religion.
3. Apply logical reasoning in decision-making.
4. Analyze ethical issues in society using philosophical approaches.

5. Evaluate existentialist ideas and their impact on modern thought.

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

GSS 212: Peace and Conflict Resolution 2 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand the nature and causes of conflicts.
2. Differentiate between conflict management and conflict resolution.
3. Analyze the role of peace movements in global stability.
4. Understand gender perspectives in peacebuilding.
5. Apply non-violent communication strategies in conflict resolution.

Evolution of peace studies; meaning and critical concepts and features of peace; links between peace and other pillars of human security. Nature and focus of peace movements: peacemaking and peacebuilding. Violence, violence theories, and philosophical underpinnings of non-violence. Conflict and ways of dealing with it (conflict management, conflict resolution and conflict transformation). Peace cultures and peace education (tools, methodologies and outcomes). Feminist perspectives of peace (gender issues - gender discrimination, gender-based violence, gender equity and development).

ENG 221: Strength of Materials I 2 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand the fundamental concepts of stress and strain in materials.
2. Analyze shear forces and bending moments in beams.
3. Calculate deflections in beams using different methods.
4. Apply Mohr’s stress circle to determine principal stresses and strains.
5. Evaluate torsional stresses in circular shafts.

Introduction to stress and strain; some simple states of stress and strain; stresses; the relationship between loading shearing forces and bending moment; composite shafts and tensional strain energy. Deflection of beams, Macaulay’s method, area moment method, Maxwell’s reciprocal rule, built-in and continuous beam in various loading situations; complex stress and strain, Mohr’s stress circle, principal stress and strain, electric constant and volumetric strain; St. Venant’s theory; stress in composite materials, bending of plates; membranes. Stresses; stresses in thin cylinders and spheres; thermal stresses; stresses in rivets, joints, etc.; use of strain gauge and other measuring devices. Torsion of circular cross- sections; torque diagram, angle of twist, shear stress due to torsion; power transmission by shafts—helical springs.

ENG 222: Engineering Drawing II 2 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Apply auxiliary projections and true length concepts.
2. Develop surface intersections and projections of solids.
3. Create assembly drawings for mechanical devices.

4. Interpret IS (International Standards) codes for engineering drawings.
5. Understand connections, fasteners, and welding symbols in drawings.

Projection of lines and laminate (Traces); Auxiliary projections. True length. The interpenetration of surfaces. Development of surfaces. Screw thread and threaded screwed fastening. Application of engineering curves: gears, cam, helices etc. Introduction to assembly drawing of machines, devices and installation layout; itemization and part listing. Drawing office practice and reprographics. Connections in engineering drawing. Introduction to IS code of drawing.

ENG 223: Computer Programming **3 Units**
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand the fundamentals of programming languages such as C, Java, and Python.
2. Develop algorithms and flowcharts for problem-solving.
3. Write and debug simple programs using structured programming techniques.
4. Implement data structures and object-oriented programming concepts.
5. Apply programming skills to engineering problem-solving.

Computer, computing and engineering, algorithms flow chart and pseudo code. Computer languages, Visual Basic programming, programming in FORTRAN, C#, JAVA and Other higher programming languages. Introduction to Data-based programming. Debugging techniques. Computer code security. Laboratory: hands-on experience on components using compilers to run programs and solve simple analysis problems in fluid, thermodynamics, heat transfer and electrical systems.

ENG 224: Material Science **2 Units**
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand the atomic and molecular structure of materials.
2. Analyze the mechanical and electrical properties of metals, polymers, and ceramics.
3. Explain the significance of phase diagrams in material selection.
4. Apply heat treatment techniques to improve material properties.
5. Identify common material failure mechanisms such as corrosion and fatigue.

Atomic and molecular structures. Reaction and phase equilibria, reaction rate and rate laws. Mechanisms theories of elementary processes, photochemical reactions and fundamental electrochemistry. Crystals: defects in crystals, metallic states, conductors, semi-conductors and insulators. Alloy theory-application to industrial alloys steel in particular. Engineering Properties-their control. Hot and cold working, heat treatment, etc. Principles of mechanical testing, impact test, tensile test, hardness test, fatigue test, creep test and non-destructive test. Fracture, corrosion and corrosion control. Equilibrium and rate of reaction. Non-metallic materials- glass, rubber, concrete, plastics, wood, and ceramic. Electrical properties. Magnetic materials: properties and characteristics. Domain theory, magnetostatic, anisotropy, losses permanent magnets, transformers, cores. Electric materials: liquid, solid and organic dielectrics polymers: properties/characteristics, inorganic materials, piezoelectric and Ferro-electric materials, composite structures, conductors, superconductors and insulators.

ENG 225: Fluid Mechanics I **3 Units**
Learning Outcomes:

Upon completing this course, students will be able to:
1. Understand fundamental fluid properties and behavior.
2. Apply Bernoulli's equation to fluid flow problems.
3. Analyze pressure distribution in static and dynamic fluids.
4. Evaluate the performance of pumps and turbines.
5. Understand the impact of viscosity on fluid flow.

Fluid fundamentals: Definitions, units and dimensions. Elements of fluid statics: Fluid density, pressure, surface tension, viscosity, compressibility, manometer, fluid thrust on immersed plan surfaces, floatation and stability. Fluid dynamics: Conversion laws, continuity equations, Euler's equation, Bernoulli's equation, fluid power, momentum equation with application impact jet. Introduction to incompressible viscous flow. Reynold's number, simple flow measurement with current meters. Hydraulic machinery: types of machines; impulse and reaction turbines performance curve of centrifugal pumps turbines axial pumps, specific speed of pumps, multistage pumps, characteristics performance curves of pumps.

ENG 226: Engineer in Society **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:
1. Analyze the historical impact of engineering on societal development.
2. Understand professional ethics and responsibilities of engineers.
3. Evaluate the role of engineers in sustainable development.
4. Understand safety regulations and risk management in engineering.
5. Appreciate the importance of engineering standards and codes.

Review of history and philosophy of science, engineering and technology; - growth and effect of technology on society, industrial revolution, etc. Engineering professional bodies and societies. Ethics, cannons, codes, and standards of engineering societies. Education and training of engineering personnel's. The role of engineers in nation building. Safety in engineering and introduction to risk analysis. She invited lectures from professionals.

EME 229: Fluid Mechanics Laboratory **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:
1. Perform experiments to determine viscosity and surface tension of liquids.
2. Analyze stability and center of gravity in floating bodies.
3. Measure flow rates using Venturi meters and orifice meters.
4. Evaluate Reynolds number for different flow regimes.
5. Interpret experimental data related to fluid machinery.

Laboratory session: Newtonian viscosity of a liquid: Absolute and kinematics viscosity measurement, surface tension, floating pontoon stability, and centre of gravity determination. Impact jet experiments, viscosity meter, Reynolds's dye experiment, performance curves of pumps and turbines and other topics covered in ENG 225.

EME 220: Material Science Laboratory **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Conduct tensile and impact tests on various materials.
2. Analyze fracture patterns and failure mechanisms.
3. Perform hardness and fatigue tests on metals.
4. Evaluate the electrical and magnetic properties of materials.
5. Apply non-destructive testing techniques to assess material integrity.

Mechanical test: Impact test, Tensile test, Hardness test, Fatigue test, Creep and non-destructive test of engineering materials, testing of magnetic materials e., g. transformer cores, testing of insulators, cables and transformers coil, and verification of P-N junction characteristics. Tensile tests on bars, Determination of young's modulus of rigidity of materials of close coiled helical spring and stiffness of spring. Determination of normal stresses in a beam under bending. Deformation of circular hallows shafts. Static deflection of springs and other practicals drawn from the topics covered in the strength of materials (ENG 221).

MTH 221: Mathematical Methods II **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Solve first and second-order ordinary differential equations.
2. Apply Laplace transforms to engineering problems.
3. Analyze boundary value problems in physical applications.
4. Use numerical methods for solving differential equations.
5. Apply differential equations to real-world engineering scenarios.

First-order ordinary differential equations. Existence and uniqueness of solutions. Second-order ordinary differential equation with constant coefficients. General theory of the nth order linear ordinary differential equations. The Laplace Transform. Solution of initial and boundary value problems by Laplace transform method. Application of ordinary differential equations to physical, life and social sciences.

STA 224: Statistics for Physical Sciences & Engineering **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand measures of central tendency and dispersion.
2. Apply probability distributions such as normal and binomial distributions.
3. Conduct hypothesis testing and statistical inference.
4. Perform regression and correlation analysis.
5. Utilize statistical methods in experimental design and quality control.

Measures of central tendency. Measure of location and dispersion in simple and grouped data. Exponential distribution, Theory of probability and probability distributions; normal, binomial poison, geometric, negative binomial distributions. Estimation and hypothesis testing. Statistical inference; parameter estimation. Regression, correlation and analysis of variance. Elements of experimental design.

GNT 221: Introduction to Entrepreneurship **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the fundamental principles of entrepreneurship.

2. Identify business opportunities and assess their viability.
3. Develop strategies for business growth and management.
4. Analyze financial planning and budgeting for startups.
5. Understand the role of innovation and technology in entrepreneurship.

Concept of entrepreneurship/intrapreneurship; Theories of entrepreneurship, concept of corporate entrepreneurship, entrepreneurial/Intrapreneurial mind- the strategies, habits, attitudes and behaviours that work for entrepreneurs/intrapreneurs, barriers to entrepreneurial culture. Nigerian business environment: political, legal, socio-cultural, economic, technological, etc., Monitoring and identifying opportunities and treats. Creativity and intellectual Property Rights. The interface between entrepreneurship and technology development, advances in technology and the impact of technology on business. Management of innovation. Family business and succession planning. Women entrepreneurship. Social entrepreneurship, Business opportunity evaluation

ENG 200: Students Work Experience Programme I **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Gain practical experience in basic engineering workshop operations.
2. Develop skills in machining, welding, and electrical work.
3. Understand workplace safety procedures and industrial ethics.
4. Apply theoretical engineering concepts to real-world problems.
5. Document and present a technical report on the industrial training experience.

Eight weeks of practical training, a long vacation (after the second semester) on bench work/machining, welding/metal joining and forming processes, basic electrical workshop practice and carpentry. Each student must submit a log book and a report describing significant experiences gained after the training. The report will be defended orally at a seminar.

ENG 313: Engineering Analysis **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Apply complex variables and conformal mapping techniques.
2. Solve differential equations using Laplace transforms.
3. Analyze Fourier series applications in engineering.
4. Utilize numerical methods for solving equations and integrals.
5. Apply statistical analysis and error estimation in engineering calculations.

Complex derivatives and analytical functions. Bilinear transformation, conformal mapping, contour integration, Cauchy’s integral theory, residue theorem, applications and Riemann’s surfaces. Special functions, Bessel’s equation, Fourier series and Legendre functions. Simultaneous differential equations with constant coefficients; Laplace transforms methods—linear second order differential equations with constant and variable coefficients. Review second-order partial differential equations: - Laplace, wave and diffusion equations, initials and boundary value problems, separation of variables, and similarity solutions. Solution of equations by iteration. Newton-Raphson Method; errors. Numerical differentiation and integration, Simpson’s rule. Introduction to interpolation and curve fittings. Statistical Analysis; Regression and correlation – large sampling theory, hypothesis testing and quality control. Introduction to system modelling/simulation.

EME 311: Mechanics of Machines 1 **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Analyze different types of mechanisms and their kinematics.
2. Evaluate forces acting on machine elements.
3. Understand the principles of gyroscopic motion and governors.
4. Analyze cam profiles and their applications.
5. Study the balancing of rotating and reciprocating machines.

Review of mechanisms; kinematics of mechanisms and kinematics analysis. Cam, complete static and dynamic forces analysis. Gyroscope. Flexible shaft couplings, virtual work, energy and speed fluctuations in machines. The flywheel and mechanical governors. Acceleration of geared systems, equilibrium of machines, brakes and dynamometer mechanisms. Spiral gearing and theory of involutes gearing simple, compound and epicyclical gear trains. Dynamics of rotating and reciprocating machines, static and dynamic balancing of machines. Balancing of rotating masses, multi-cylinder engines and governors.

EME 312: Workshop Practice II **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand advanced welding techniques and their applications.
2. Perform various metal joining processes such as brazing and riveting.
3. Understand foundry processes including moulding and casting.
4. Analyze defects in welded and cast components.
5. Apply quality control techniques in workshop manufacturing.

Joining Technology: - Welding metallurgy, modern welding techniques and applications of industrial alloys. Destructive testing of materials, Analytical principles, science, technology design and manufacture of the various means of joining materials and structures in industrial applications. Welding. Fusion (MMA, GMA, ESW, TIG, MIG), resistance, electron beam, flash and friction welding. Inter-relationship between microstructure strength and toughness of welded joints. Heat inputs rate, HAZ, carbon equivalent, throat, post-weld treatment, residual stress, stress relief, reinforcement. Brazing and soldering, weld defects, their causes and remedial action: lack of preparation, solidification cracking, lamellar tearing, reheat cracking. Basic elastic fracture mechanics applied to defect assessment. Mechanical fasteners, pressure seals, preload, bolt tensioning, tension and compression paths. Corner cracking, swaging hole expanding. Relative advantages and disadvantages of joining methods: effects of processing variables, significance of defects. Stress analysis and design of joints. Statics and dynamic loading, fracture and fatigue, fracture mechanics assessment, service life predictions, economic aspects and quality control. Foundry Practice: Pattern making, moulding, melting and pouring. Principles of solidification of metals and alloys, Design of gates and risers. Castings.

EME 314: Mechanical Engineering Design I **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the principles of machine design.
2. Select appropriate materials for engineering applications.
3. Analyze stresses in mechanical components under different loads.

4. Design mechanical joints such as riveted and welded connections.
5. Develop working drawings for designed components.

Philosophy of engineering design and 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, a system of fits and limits. Dimensional and geometrical tolerance. Interchangeability. Surface texture; marking machine surfaces. Standard machine elements. Marking of riveted, welded and threaded joints on engineering drawings. Design of joints: Riveted joints: Friction effect; 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 deformations of joined parts. Power screws; Strength and efficiency. Key and pin joints: Unstrained, Strained, fixed and sliding joints. Design Assignments on Jockey-Pulley Assembly drawing, Knuckle joint. Scope of the task: - Calculation, workshop and assembly drawings, technical description of production, operation and maintenance.

EME 315: Strength of Materials II **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Analyze three-dimensional stress and strain conditions.
2. Apply energy methods to solve elasticity problems.
3. Understand failure theories for engineering materials.
4. Calculate deflections in statically indeterminate structures.
5. Evaluate impact and fatigue loading effects on materials.

Complex stress and strains; two-dimensional stress and strain analysis. Concepts of stress at a point. Principal stress, principal strain, Hook's law: torsional loading; shear forces and bending moments. Thick and thin-walled cylindrical pressure vessels. Deflection under flexural loading, statically determinate and indeterminate structures shear flow, strain energy, failure theories, repeated loading and impact loading. Three-dimensional stress and strain analysis. Experimental stress analysis.

EME 316: Engineering Drawing III **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the principles of permanent and separable joints in engineering.
2. Develop advanced engineering drawings, including curved surfaces and intersections.
3. Apply computer-aided design (CAD) software to generate 2D and 3D models.
4. Interpret and modify machine assembly drawings.
5. Understand and apply tolerance, limits, and fits in engineering design.
6. Utilize solid modeling techniques such as extrude, loft, sweep, and revolve.

Review of joints: Permanent and separable joints. Advanced problems in the development of curved surfaces and intersections, machine drawings of units and assembled-working drawings of machine units, shaft fittings, Fits, Limits; Tolerance and their specifications, inter-changeability requirements for machine units and assemblies; workshop drawing-correction and modification of drawings. Introduction to Computer-Aided Design and Drafting. Review of parts, assemblies and 2D-engineering drawing. Introduction to essential CAD software. Different drawing file formats. Multi-view sketching. Solid modelling: Extrude, loft, sweep, and revolve: drafting and presentation.

EME 317: Electromechanical Systems 3 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand the principles of AC and DC motors.
2. Analyze transformer operations and applications.
3. Design basic electromechanical control systems.
4. Implement microcontrollers in electromechanical applications.
5. Study energy conversion methods in electromechanical systems.

Review of AC circuit and baric AC circuit concept: power factor, phasor diagram, power measurement technique, etc. Magnetic circuit Analysis: Equivalent at magnetization curve. Transformers: Types, theory of operation, equivalent circuit, per unit system. Energy conversion. Principles, force calculation, systems and dynamics. Rotating machines: Direct current (DC) and alternating (AC) motors and generations. Types of power flow and losses, torque-speed characteristics. Introduction to electronic devices and intelligent electromechanical systems and their applications to mechatronics system design: A/D, D/A converters, op-amps, filters, power devices, stepper motors, solenoids, etc.
Laboratory session involving the design of an inductor using ferrite core using different core shapes like toroid, E-I, E-E shapes, lamp-test experiment and construction of a DC and AC motor and generator. Introduction to low-cost automaton using electro-pneumatic, electro-hydraulic systems, sensors, actuators etc.

EME 318: Fluid Mechanics II 2 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Apply control volume analysis to solve fluid dynamics problems.
2. Understand boundary layer theory and its applications.
3. Analyze compressible fluid flow and shock waves.
4. Evaluate turbulence effects in fluid systems.
5. Study flow measurement techniques in engineering applications.

Kinematics of fluid motion: Streamlines, Velocity, Acceleration, Rotation and Circulation. Control volume analysis: continuity, momentum, angular momentum and energy equations. Euler and Bernoulli equations; Differential; Laminar Incompressible flow between parallel plates, Circular tubes and Circular annuli. Laminar and turbulent flow in pipes, fluid pressure measurements, velocity and flow rates. Dimensional analysis and similitude. Navier-Stoke Equations. Two-dimensional irrational (Potential) flow; the Stream function and velocity potential; simple flows and their superposition. Boundary layer theory; Von Karman's integral momentum equation, laminar and turbulent boundary layers, flow separation and wake, drag and lift. Compressible fluid flow; compressibility effects, isentropic flow through variable area ducts, plane shock, waves. Flow with heat exchange and flow with friction.

EME 319: Automotive Workshop Technology I 1 Unit
Learning Outcomes:
Upon completing this course, students will be able to:

1. Identify and use various tools and safety procedures in an automotive workshop.
2. Explain the working principles of engine components such as valves, pistons, and crankshafts.
3. Perform basic engine maintenance and troubleshooting techniques.
4. Understand the design and functionality of automobile transmission systems.
5. Analyze braking and suspension systems in automobiles.
6. Explore electrical and control systems in modern automobiles.

Introductions to automotive workshop layout, tool and safety practices: Theory and practical works on engine performance and operating systems; valves, cylinder block and head, pistons and connecting rods, crankshaft, etc. Engine balancing. Cooling, lubricating, and fuel supply systems. Automobile transmission systems (clutches, gearboxes, drive shafts, universal joints, back axle and differential). Brakes, front axle and steering mechanism. Suspensions. Electrical electronics and control systems of automobiles. Engine main components design.

GNT 311: Business Development and Management **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the fundamental principles of business management and leadership.
2. Develop strategies for conflict resolution in business environments.
3. Analyze market trends and develop business strategies.
4. Create financial and business plans for entrepreneurial ventures.
5. Implement effective customer relationship management techniques.
6. Apply information management principles in business decision-making.

Business management and leadership; Conflict management/resolution in business. Customer loyalty. Time management. Decision-making processes and new venture creation strategies /management, Market development processes; Analyzing market situations, production plan, financial plan organizational and management plan, marketing plan, business plan development. Cooperatives. Information Management. Mini Proposal Writing.

ENG 326: Technical Report Writing and Presentation **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the principles of effective technical communication.
2. Develop well-structured and professional technical reports.
3. Apply appropriate technical writing styles and formatting.
4. Improve oral presentation skills for technical ideas.
5. Utilize data visualization tools to enhance technical reports.
6. Demonstrate the ability to critique and edit technical documents.

Principles of effective communication. Professional use of the English language. Principles of technical writing. Types of technical reports/technical articles. Oral presentation of technical ideas.

EME 321: Engineering Thermodynamics II **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Explain the principles of entropy and exergy in thermodynamic systems.
2. Analyze power cycles such as the Rankine and Brayton cycles.

3. Evaluate the efficiency of turbines, compressors, and heat exchangers.
4. Understand the thermodynamic behavior of gas mixtures and solutions.
5. Apply thermodynamic concepts to real-world engineering applications.
6. Utilize mathematical models to solve complex thermodynamic problems.

Entropy: Clausius inequality; Definition of Entropy; Tabular and Graphical Entropy data for water and refrigerants; Tds relationships, Entropy balance for closed systems and control volumes; Isentropic processes; Isentropic, efficiencies of turbines, nozzles and compressors. Exergy Analysis: Definition of exergy; exergy reference environment; dead state; exergy equation; exergy balance for a closed system, flow exergy; exergy balance for control volumes. Vapour power system: Simple vapour power plants; thermal efficiency, work ratio; ideal Rankine cycle; Rankine cycle with superheat and reheat; regenerative vapour power cycles.Gas power system: Simple gas turbine, air-standard Brayton cycle, regenerative gas turbine cycles, reciprocating internal combustion engines, air-standard Otto cycles, Diesel cycles, dual cycles. Mixtures and solutions.

EME 322: Manufacturing Technology **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the historical development of machining and manufacturing processes.
2. Operate machine tools such as lathes, milling machines, and grinders.
3. Analyze cutting tool geometries and wear mechanisms.
4. Implement automation techniques in modern manufacturing.
5. Perform machining operations with accuracy and precision.
6. Understand the maintenance and installation of machine tools.

History of machining and machine tools. Lathes, drill press, millers and grinders. Turning and boring, drilling, reaming, milling, planning, shaping and grinding processes. Slotting and broaching, honing and lapping, gear cutting, cutting tool, cutting forces, cutting tool geometry, tool failure and tool wear mechanisms, cutting fluid and surface finishing. Determination of spindle speeds and feed speeds, chipless material removal processes. Introduction of automation in manufacturing visualization fixtures. Machine tool installation, testing and maintenance. Workshop practicals based on topics covered.

EME 323: Measurement and Instrumentation **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the principles and standards of measurement.
2. Apply interferometry techniques to measure small distances accurately.
3. Use measuring instruments such as sine bars, comparators, and optical flats.
4. Perform precision measurements in force, pressure, and temperature analysis.
5. Analyze errors in measurement and calibration techniques.
6. Apply measurement principles in industrial and laboratory settings.

Standards of measurement: Past and present standards of measurement; End standards; Line and wavelength standards; End bars and slip gauges. Grades of slip gauges, use, care, manufacture and calibration of slip gauges. Interferometry: Theory of interference of light. Optical flats; uses of optical flats interferometer. Measurement errors: Linear measurement: Measuring instruments and comparators. Design and operation of measuring instruments. Angular measurements and circular divisions: sine bars, angle gauges, clinometers; autocollimators and angle dekkos; reflectors and optical square. Calibrating circular divided scales and indexing equipment, Precision polygons and their calibration, Testing straightness, flatness and squareness, Taper measurement, Screw thread measurement, Gear measurement: The involute shape. Tooth thickness measurement. Pitch measurement. Measurement of surface finish. Essential electronic measurement and sensing devices. Displacement, area, force, velocity, acceleration, power, torque, vibration, stress, strain, pressure, flow, temperature, and thermal and transport properties measurements. Laboratory session on system response and performance. Dynamic and vibration measurements of systems. Strain and temperature measurements. Operational amplifiers. Experimental data acquisition and analysis techniques.

EME 324: Engineering Metallurgy I **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the properties and selection criteria for engineering materials.
2. Explain metallurgical thermodynamics and chemical extraction processes.
3. Analyze phase diagrams and their applications in materials engineering.
4. Evaluate the mechanical properties of metals and their industrial applications.
5. Understand the fundamentals of iron, steel, and non-ferrous alloy production.
6. Apply metallurgical principles to material design and performance optimization.

Review of properties and selection of engineering materials, metallurgical chemistry and thermodynamics; the modification of properties of engineering materials through changes in microstructure, ethograms diagram-oxidation and reduction of metals –Refractories, furnace. Extraction of metals from ores, electrochemical extraction. Extraction of refractory metals, iron and steel making; alloy steels, cast irons, aluminium, copper and their alloys. Equilibrium phase diagrams: iron/ carbon equilibrium diagram and other phase diagrams.

EME 325: Machine Systems Dynamics **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the principles of dynamic motion and vibration in machines.
2. Analyze moments and products of inertia in mechanical systems.
3. Solve problems involving free and damped vibrations.
4. Apply computational methods for machine vibration analysis.
5. Study noise control methods and their applications in mechanical systems.
6. Design high-speed rotating machinery for stability and performance.

Dynamics: moments and products of inertia, the symmetrical top, Lagrangian mechanics, stability and resonance of dynamical systems and space mechanics. Mechanical vibrations; Properties of oscillatory motion. Derivation of governing differential equations. Free and damped vibrations. Harmonically excited motion, rotating and reciprocating unbalance, supports the motion. Vibration measurements. Vibrations in multi-degrees-of-freedom systems. Methods of vibration suppression and control: vibration absorbers. Continuous systems. Calculating alternating stress from vibration amplitude via mode shape; interpreting fatigue failure surfaces. Steady stresses from centrifugal forces and dynamic stability of high-speed rotors. Design of high-speed rotating machinery with vibration problems, such as turbines etc. Acoustics: one-dimensional acoustic waves. Sound radiation and sources. Plane and spherical wave propagation. Duct acoustics. Wave transmission and reflection from solids. Noise control. Analytical and computer solutions to mechanical systems' typical acoustic, vibratory, and balance problems.

EME 326: Automotive Workshop Technology II **1 Unit**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Perform wheel balancing and alignment in automotive maintenance.
2. Diagnose and troubleshoot common automobile faults.
3. Analyze automotive bodywork techniques and structural integrity.
4. Understand electronic engine control systems and vehicle diagnostics.
5. Design algorithms for vehicle motion control.
6. Apply practical skills in auto-repair and maintenance procedures.

Theory and practical works on automotive bodywork techniques: wheel balancing and alignment, routine maintenance, auto fault finding/troubleshooting techniques and rectification procedures, test and performance analysis of auto systems. Body and chassis design. Introduction to Autotronics; Electronic engine and vehicle motion control systems; Design of algorithms/programs for treatment of automotive engineering problems.

EME 327: Computer-Aided Design and Manufacture **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the fundamentals of 2D and 3D CAD modeling.
2. Utilize computer-integrated manufacturing (CIM) systems.
3. Develop and simulate engineering designs using CAD software.
4. Program and operate CNC (Computer Numerical Control) machines.
5. Implement control systems and programmable logic controllers (PLC).
6. Apply robotics and automation techniques in manufacturing.

Review of drawings using AUTOCAD (2D and 3D). Design/simulation with solid graphics and other advanced graphics in engineering. Computer Integrated Manufacturing (CIM) system. Introduction to Computer Numerical Control (CNC) Machine tools and programming. Introduction to Control Systems. Counters, Registers, Computer Memories, and microprocessors. Programmable Logic Devices. Programmable Logic Control. Mechatronics; microcontroller programming interfacing and applications in classical control concepts and mechatronics system design. Robotics and their applications: Types, locomotion, kinematics, dynamics and control of robots.

EME 328: Production Planning and Control **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand different types of manufacturing production systems.
2. Implement material requirement planning (MRP) and inventory control.
3. Analyze scheduling techniques for job sequencing and queuing.
4. Evaluate production management techniques for efficiency.
5. Develop cost estimation models for production planning.
6. Apply quality control methods to manufacturing processes.

Manufacturing system analysis, Types of production, associated layout problems, materials handling and control. Network analysis: Arrow diagrams, bar charts, critical part methods, programme evaluation and review technique, activity crashing, scheduling, job loading and job sequencing and queuing. Production management techniques: capacity planning, materials requirement planning, inventory control models and application, Material requirement planning (MRP) and bill of measurement (BOM), planning and control of batch production, operation and maintenance management. Cost estimation methods, inspection and testing methods, introduction to quality control. Practice: Individual tasks involving condition monitoring visits to manufacturing firms and group technology tasks involving designing and implementing selected technological products in simulated production environments or constructing physical models of relevant concepts.

EME 329: Mechanics of Machines II **2 Units**
Learning Outcomes:
Upon completing this course, students will be able to:

1. Understand the principles of friction, wear, and lubrication in mechanical systems.
2. Analyze and design power transmission systems such as gears and belts.
3. Apply hydrodynamics and hydrostatic lubrication theories.
4. Study vibration effects and noise control in mechanical systems.
5. Use computational software for tribology analysis.
6. Design efficient machine components for mechanical stability.

Friction, wear and lubrication applications in kinematics; selection of power screws, belts, ropes and chains drives, clutches, brakes and dynamometer. Hydrodynamics and hydrostatic lubrication: journal bearing Reynolds equation, graphical solutions, oil and gas bearings. Hydrodynamics drives, torque converters, vibrations computational procedures and software packages for analysing tribological problems.

EME 320: Mechanical Engineering Laboratory I **3 Units**
Learning Outcomes:
Upon completing this course, students will be able to:

1. Perform experimental analysis of mechanical systems.
2. Apply measurement techniques for mechanical properties.
3. Understand material testing procedures, including tensile and impact tests.
4. Analyze fluid mechanics and thermodynamics experiments.
5. Interpret experimental data using statistical methods.
6. Develop technical reports based on laboratory findings.

Laboratory practical session covering topics taught in ENG 215, EME 311, EME 315, EME 317, EME 323, EME 324, EME 325 and EME 329.

ENG 300: Students Work Experience Programme II **1 Unit**
Learning Outcomes:
Upon completing this course, students will be able to:

1. Gain hands-on experience in an engineering-based industry.
2. Apply academic knowledge to real-world engineering problems.
3. Develop skills in CNC machining and conventional manufacturing.
4. Improve teamwork and communication in professional environments.
5. Understand industrial safety and maintenance procedures.

6. Prepare and present technical reports on work experience.

Each student will be attached to an engineering-based industry, government ministry or research institute to undergo a 3-month practical training on conventional manufacturing processes, CNC machining, automotive maintenance services, maintenance of equipment and building services under the guidance of qualified personnel in the establishment but supervised by an academic staff of the department. A logbook and a written report describing significant experiences gained during the 3-months must be submitted by each student. The report will be defended orally at a seminar.

ENG 418: Computational Methods in Engineering 3 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Apply numerical methods to solve engineering problems.
2. Implement interpolation and differentiation techniques.
3. Utilize MATLAB and Simulink for engineering simulations.
4. Solve ordinary differential equations using Euler and Runge-Kutta methods.
5. Analyze convergence and stability in computational models.
6. Apply computational tools to optimize engineering solutions.

Polynomials and their zeros: bisection methods, Barstow synthetic division and lamer. Divert methods for the solution of linear equations. Convergence: interpolation and differentiation method in numerical integration. Newton Coates formulae and finite difference methods. The Eigenvalue problem solution of ordinary differential equations. Methods of Taylor, Euler, Predictor- corrector and runge-kutta. Application of MATLAB and Simulink in engineering systems analysis.

EME 411: Applied Thermodynamics 2 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand the working principles of rotary and reciprocating compressors.
2. Analyze combustion processes in hydrocarbon fuels.
3. Apply thermochemical principles to energy conversion.
4. Evaluate heat transfer in internal combustion engines.
5. Study efficiency improvements in thermal power cycles.
6. Design and optimize thermodynamic systems.

Multistage reciprocating compressors: the rotary compressors, centrifugal and axial-flow; stagnation properties. Combustion of fuels; chemistry of common hydrocarbon fuels; combustion with deficiency or excess air. Thermochemistry; Hess law of Heat summation; Heat of combustion and reaction; Ideal adiabatic flame temperature; reciprocating internal combustion engines.

EME 412: Engineering Metallurgy II 2 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand advanced metal strengthening techniques such as age-hardening.
2. Analyze fracture mechanics in metals, ceramics, and polymers.
3. Study high-temperature oxidation and corrosion resistance.
4. Evaluate composite materials and their applications.
5. Apply X-ray and electron diffraction methods in metallurgy.

6. Implement material processing techniques for industrial applications.

Age-hardening and isothermal transformation processes, quenching and tempering hardenability and graphitization processes. Fracture mechanics applied to metals, ceramics and polymers. Dislocation x-ray and electron diffraction. Industrial metallurgy, corrosion and high-temperature oxidation theories. Metal conversion: copper, aluminium, lead, etc. Quenching of metals, glasses, polymer tiles, paper and wood. Transport processes, analysis of heat and mass in material processing operations. Composite Materials: Fiber-reinforced composites. Stress, strain, and strength of composite laminate. Failure criterion. Design of composite structure and industrial application of composites.

EME 414: Mechanical Engineering Design II **3 Units**
Learning Outcomes:
Upon completing this course, students will be able to:
1. Design shafts and axles for mechanical applications.
2. Analyze stresses in gears, bearings, and clutches.
3. Evaluate power transmission systems such as belt and chain drives.
4. Apply finite element analysis in mechanical component design.
5. Develop workshop drawings using CAD software.
6. Optimize mechanical systems for strength and durability.

Shafts and Axles: Classification, loads, fatigue considerations; materials. Application of strength theories. Types of shafts. Axles and shafts of uniform strengths. Stiffness of shafts (deflection and torsional stiffness). Transverse vibration: Critical velocity of shafts, semi-graphical method of shaft design. Geometry of shafts. Power transmissions: Types of drives; Belt and rope drives; Euler's equation; stresses in belts; flat, vee and toothed belts. Geometry of belt pulleys. Chain Drives; Gears Drives: classification; - spur, bevel, worm, helical, etc. Geometry. Standard modules. Calculations for strength and wear. Materials selection; velocity; machining; lubrication. Gear trains; velocity ratio and efficiency; service life; minimum number of teeth. Diagrammatic (simplified) representation of various drives. Toothed gears in engineering drawing dimensioning. Cast and welded gears. Couplings and clutches; Brakes; Bearings; -classification and application of her stresses theory. Element of fluid power system design. Design of cylinders, pipes, pipe joints, tubes, plates, flywheels, seal packaging, gaskets and shields. Design Assignment; pressure vessel, screw jack etc. Scope of the task: - Calculation, workshop and assembly drawings using suitable computer software, technical description of production, operation and maintenance.

EME 415: Heat and Mass Transfer **3 Units**
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand the mechanisms of heat transfer: conduction, convection, and radiation.
2. Apply Fourier's and Newton's laws to thermal analysis.
3. Design and analyze heat exchangers for industrial applications.
4. Evaluate the efficiency of extended surfaces and radiators.
5. Study mass transfer between different phases in engineering systems.
6. Apply heat transfer principles to drying and humidification processes.

Heat transfer mechanisms: conduction, convection, radiation. Conduction and convection: general heat conduction equation, steady-state conduction in one dimension; heat flux, specific heat capacity, thermal conductivity and heat transfer coefficient, Fourier's and Newton's laws; thermal resistance of plane, cylindrical and spherical walls and fluid boundary layers; overall heat transfer coefficient; extended surfaces; fin efficiency, radiators. Heat exchangers: parallel and counter flow; logarithmic mean temperature difference; effectiveness. Radiation: radiation Intensity, Stefan-Boltzman law; black and grey bodies; emission and absorption: grandiosity; radiation resistance networks. Mass Transfer: Mass Transfer between phases; humidification of gases; evaporation types of dryers.

EME 416: Applied Fluid Mechanics 2 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the working principles of turbomachinery.
2. Analyze hydrodynamic and hydrostatic lubrication systems.
3. Study aerodynamics and gas dynamics applications.
4. Evaluate the performance of pumps, compressors, and turbines.
5. Implement flow measurement techniques in engineering.
6. Apply fluid mechanics principles to real-world industrial processes.

Turbomachinery: axial and radial machines; compressors, pumps, turbines, fans, blowers, etc. Fluid couplings and lubrication mechanics; hydrodynamics theory applied to tapered wedge and journal bearings; hydrostatic lubrication applied to journal bearings. Gas dynamics and applications. Basic concepts of Aerodynamics and applications.

EME 417: Productivity and Technology Development 2 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the role of productivity in economic development.
2. Apply work-study techniques to improve manufacturing efficiency.
3. Analyze factory layout and process optimization.
4. Study time management and performance measurement techniques.
5. Evaluate the impact of energy policies on industrial growth.
6. Develop strategies for technology innovation and implementation.

Productivity, the effect of productivity and standard of living and economic development. Techniques for increasing productivity; work-study and its advantages. The basic procedure for the study method, use of charts and symbols, factory/shop layout, and examples of method study. Basic procedure for work measurement, time study, ratio delay/activity sampling method. Effect of working conditions, e.g., cleanliness, lighting, ventilation, and safety precautions. Value Engineering. Energy policy and planning. Organizational structure, information Technology (IT) and performance; Networking. Industrialization and economic development of developing and developed countries. Sources of funds for financing investments, infrastructures (social and economic), and standard of living. Group technology tasks involving improvement on the productivity of systems.

EME 410: Mechanical Engineering Laboratory II 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Conduct experiments on heat transfer, fluid mechanics, and thermodynamics.
2. Analyze system response and performance of mechanical components.
3. Measure strain, temperature, and vibration in engineering structures.
4. Utilize data acquisition techniques in mechanical testing.

5. Apply statistical methods in experimental research.
6. Develop technical reports based on laboratory findings.

Laboratory session covering topics taught in Thermo-Fluids courses: ENG 211, EME 318, EME 411, EME 321, EME 415 and EME 416.

GNT 411: Practicum **2 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Gain hands-on experience in industrial production processes.
2. Apply entrepreneurship skills in business plan development.
3. Develop technical and managerial skills in manufacturing.
4. Evaluate the economic feasibility of engineering projects.
5. Implement problem-solving strategies in real-world scenarios.
6. Present a business plan for assessment by industry professionals.

Students shall be attached to relevant production units for practical training on trades of their choice, including group technology manufacture. Each develops a business plan report to the Centre for Entrepreneurial Development for examination.

ENG 400: Students Industrial Work Experience Scheme **15 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Gain hands-on experience in an engineering industry.
2. Develop problem-solving skills in a professional setting.
3. Apply academic knowledge to real-world engineering projects.
4. Improve teamwork and communication skills.
5. Prepare and present a technical report on the industrial experience.

Each student shall be attached to an industry of engineering concern, government ministry or research institute for six months of industrial training under the guidance of appropriate personnel in the establishment but supervised by an academic staff of the department or faculty. A logbook containing a list of activities undertaken must be submitted. Each student must also submit a written report describing significant experiences gained during the 6-months SIWES. The report will be defended orally at a seminar.

EME 511: Engineering Management **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the principles of engineering project management.
2. Apply financial analysis techniques to engineering investments.
3. Analyze economic feasibility for engineering projects.
4. Implement quality control and productivity improvement methods.
5. Understand the role of leadership and teamwork in engineering.

Review general principles of management and appraisal techniques: planning, organizing, influencing, coordinating, forecasting and controlling in engineering and management system interactions. Emphasis on communication skills, teaming, job design, leadership, facilitation, negotiation processes, and employee productivity in corporate organizations. Engineering investment analysis; relevant costs, interest factors and inflation. Economic equivalence/investment evaluation methods; - expected value factor, standard deviation, coefficient of variation, capital recovery period, annual/future/present worth methods, break-even analysis, etc. Replacement analysis, budgeting and budget control, taxes, depreciation and feasibility study of engineering projects. Logistic management. Engineering management roles in health care delivery; Application of industrial engineering tools to solve health care delivery problems focused on cost reduction, process redesign, facility design, quality improvement, and systems integration. Entrepreneurship and business development; technical, business, and operational specialities integration in a project consulting firm. Group technology tasks involve designing, planning and implementing an engineering project to stimulate students' multidisciplinary teams' working ability or application of industrial engineering tools in evaluating and solving any practical organizational problem.

EME 512: Refrigeration and Air-Conditioning 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the working principles of refrigeration cycles.
2. Analyze different types of refrigerants and their applications.
3. Design basic air-conditioning systems.
4. Evaluate thermal comfort conditions in HVAC applications.
5. Perform cooling load calculations for buildings.

Fundamentals of vapour compression refrigeration cycles and equipment. Refrigerants and their properties. Absorption refrigeration systems. Low-temperature refrigeration. Refrigeration applications, Elements and Designs of refrigeration systems. Reverse application of Reverberation heat pumps. Steady-state and transient cooling load calculations. The principle of Air conditioning emphasises thermodynamic processes involving air, water, vapour, and mixtures. Production of atmospheric and thermal environments for human activity heat sources and climatic considerations. Comfort and physiological aspects. Psychometry and psychometric process. Evolution of cooling and heating loads. Methods of reducing cooling loads. Air-conditioning systems and equipment, duct and fans. Chilled water and condenser water piping. Steam piping and heating systems. Air-conditioning controls. Ventilation and air conditioning systems.

EME 514: Mechanical Engineering Design III 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Apply optimization techniques in machine design.
2. Develop systematic design processes for mechanical systems.
3. Analyze failure criteria for mechanical components.
4. Use computer-aided design (CAD) software for engineering applications.
5. Perform stress analysis on designed components.

Review of power transmission, friction drive bearings and lubrication. Design of Machine frame; classification, optimum shape, welded and cast frames. An appreciation of the engineering design process and systematic procedure and tools useable in the design process, with particular reference to mechanical systems and devices (scientific design methodology). Topics include systematic problem definition, search for possible solutions, statistical analysis of stresses/strength interference, experiment planning techniques, the optimum design for minimum weight and cost, and design process management. Application of computer graphics in design simulation and optimization. Design assignment: -Students will be required to conduct a project under supervision using the scientific design methodology. The design should involve simple mechanical systems (e.g. testing and assembling devices, heat drive, etc.) for a specified duty, design analysis and production of workable layout drawings of the system using appropriate computer applications, analysis of its operating conditions after considering the design criteria choose between potential solutions and justification for the design finally chosen—report presentation on detail design, manufacture, testing and use.

EME 515: Engineering Materials Selection and Economics 3 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand material selection criteria for engineering applications.
2. Analyze economic considerations in material selection.
3. Study the impact of recycling and sustainability on material usage.
4. Apply computer-aided material selection tools.
5. Evaluate material performance in real-world applications.

Material selection; Ashby selection maps. Introduction to the Cambridge Engineering Selection (CES) software. Evolution of the relevant factors in material selection; technical and economic considerations. Materials for structural, high temperature, cryogenic, electrical, electronic and nuclear applications. Principles and economics of recycling. Current status and prospects of necessary engineering materials.

EME 516: Automatic Control 3 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand the fundamentals of feedback control systems.
2. Analyze system stability using root locus and Bode plots.
3. Design controllers for mechanical and electrical systems.
4. Implement digital control techniques using microcontrollers.
5. Apply automatic control principles in industrial automation.

Historical development of automatic control. Control systems are open and closed-loop, characteristic of feedback, control media and control system components. Digital systems. Mathematical modelling of control systems. Transfer functions, block diagrams and signal flow graphs. Time domain analysis, transient response, steady-state error, stability and sensitivity. Routh's stability criterion. Root locus. Frequency domain analysis, Nyquist criterion, Bode plots and Nicholas charts. Signals: continuous- and discrete-time signals difference equations, z-transform; sampled-data systems, sample and hold, discrete models including state-space; discrete equivalents of continuous-time systems; stability analysis; controllability and observability of sampled-data systems; design specification; controller design using transform techniques, design using state-space methods; generalized sample-data hold functions. Control system design by compensation. Introduction to optimal control. Analysis of mechanical, pneumatic, hydraulic, and hybrid feedback control systems. Control systems of power plants.

EME 517: Engineering Law 2 Units
Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand professional ethics and responsibilities in engineering.
2. Analyze the legal framework governing engineering practices in Nigeria.
3. Evaluate contract laws and their implications in engineering projects.
4. Study occupational safety laws and risk management principles.
5. Understand intellectual property rights and business laws.
6. Apply legal concepts to case studies in engineering disputes.

Review of ethics professional responsibilities and practice of engineering in Nigeria; registration of engineers, duties and code of conduct. Law; sources and branches of Nigeria law, courts and tribunals. Law of contract. Forms of contract, criteria for selecting contractor's offer and acceptance of contracts, contract terms, supplier's duties – damages and other remedies. Duties of employers towards their employer. Duties imposed on employees. Termination/cancellation of contract liquidation and penalties. Exception clauses, safety and risk. Health and safety: Fire Precaution Act, safety laws in various engineering sectors such as industrial/manufacturing, electrical maritime, aviation, etc. Detection and control of hazards/accidents. Investigation and analysis of data and fault tree analysis. Safety codes and case studies on occupational hazards. Design for safety. Business laws.

EME 521: Theory of Elasticity and Plasticity 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand strain energy and the principle of virtual work.
2. Analyze statically indeterminate beams and column stability.
3. Study the theory of elasticity and stress-strain relationships.
4. Apply fracture mechanics principles to structural analysis.
5. Evaluate plastic deformation in engineering materials.
6. Utilize finite element methods for stress analysis.

Strain energy, the principle of virtual work; Castigiliano's theorem, the principle of most miniature works; statically indeterminate beams; columns stability of elastic mechanical systems, long straight columns effect of and conditions; the secant formula, empirical formulae for indeterminate and short columns, eccentric loading; repeated loading; impact loading anti elastic bending. Theory of plates and shells. Thermal stresses. Stresses in rotation in rotating discs. Theory of elasticity. Equilibrium and compatibility equations. Airy stress function with applications to simple problems. Crack mechanics, stress-function and approach to fracture mechanics. Direct stiffness methods, the finite element method for stress analysis. Plastic theory and plastic analysis.

EME 524: Systems Engineering 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the fundamentals of systems analysis and modelling.
2. Apply mathematical modelling techniques to engineering systems.
3. Study optimization methods for system performance improvement.
4. Implement simulation techniques for industrial applications.
5. Analyze economic and social factors affecting engineering systems.
6. Utilize programming tools for system design and control.

Basic concepts of system analysis and behaviour; categories of systems, behaviour illustrated by the study of selected mechanical, electrical, hydraulic, industrial transportation, economic, biological and social systems. System approach to problem solving. Dynamic system modeling. System modelling and optimization by algebraic and differential equations, causal loop diagramming, flow diagram, bigraph, objective tree, intent structure, differential/variation calculus, and linear and dynamic programming techniques. Introduction to system simulation. Value systems design and evaluation of the public system. Multiple objectives and criteria. Production functions and marginal analysis. Econometrics.

MEE 521: Energy Conversion Principles **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand energy conservation principles in engineering.
2. Analyze thermoelectric and photovoltaic energy conversion systems.
3. Evaluate fuel cell technology for sustainable energy production.
4. Study nuclear and geothermal energy applications.
5. Implement battery technology in energy storage systems.
6. Optimize alternative energy sources for industrial use.

Thermodynamics principles of energy conservation of systems: emphasis on direct energy conversions including thermoelectric, photovoltaic, thermionic, magnetohydrodynamic, electro-gas dynamic devices, fuel cells, solar energy and nuclear power sources. Alternative energy sources. Solar wind, tides, geothermal, hydrogen, biomass conversion battery technology.

MEE 522: Power Plant Engineering **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the principles of power generation in different plants.
2. Analyze combustion processes in solid, liquid, and gaseous fuels.
3. Evaluate steam, hydro, and nuclear power plant efficiency.
4. Study power distribution and transmission systems.
5. Implement environmental control techniques in power plants.
6. Design and optimize small-scale power generation systems.

Introduction to power plants. Energy sources, availability, resources; fundamental combustion process of solid, liquid and gaseous fuels. Steam power plants: steam generators, burner designs auxiliary power station equipment, diesel and gas turbine plants; hydroelectric power plants; dams and plant auxiliaries; nuclear power plants: fuels and nuclear fission, rector types, nuclear waste; geothermal power plants; design and operating of equipment; alternative energy forms; solar, wind, tides, geothermal hydrogen and biomass; performance and selection of prime movers of small power generating plants; fundamentals of electrical generators of performance and energy distribution systems.

MEE 523: Fundamental of Nuclear Engineering **3 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the principles of nuclear reactions and reactor theory.
2. Analyze radiation protection and health physics in nuclear plants.

3. Evaluate shielding techniques for nuclear reactors.
4. Study neutron balance and control systems in reactors.
5. Assess fuel reprocessing and waste disposal methods.
6. Apply nuclear technology in industrial and medical fields.

Introduction of nuclear reactor engineering: radiation protection and reactor safeguards, radiation hazards and health physics, reactor shielding principles and geometric transformation, shield design, nuclear reactions and radiations. Neutron balance. Neutrons reactor theory, homogeneous and heterogeneous reactor systems. Water moderated and fast reactors. Control of nuclear reactors, Thermal problems in reactor coolants, reactor structural and moderator materials. Reactor fuels: production, properties, reprocessing and waste disposal. Nuclear reactor system. Application of nuclear techniques in industries.

MEE 524: I. C. Engine Performance and Evaluation 3 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand the thermodynamics of internal combustion engines.
2. Analyze air-fuel mixtures and combustion rates.
3. Evaluate engine emission control techniques.
4. Study autotronics applications in modern engine systems.
5. Optimize engine performance for fuel efficiency.
6. Implement diagnostic techniques for engine maintenance.

Review of I.C. Engines. Fundamentals of SI and I.C. Engines cycles and their analysis. Fuels and Lubricants, properties of air-fuel mixtures, strength on ignition, flame formation, flame velocity, combustion rate, peak pressure and temperature. Engine emission and emission control. Advanced topics in autotronics engineering. Application of autotronics to I. C. Engine design and performance optimization.

MEE 525: Engineering Thermodynamics III 3 Units
Learning Outcomes:
Upon completing this course, students will be able to:
1. Understand equations of state for non-ideal substances.
2. Apply Maxwell’s relations in thermodynamic analysis.
3. Analyze fugacity and activity coefficients in chemical systems.
4. Evaluate energy transfer in reacting systems.
5. Study phase equilibrium in thermodynamic applications.
6. Apply advanced thermodynamic models to industrial processes.

Non-ideal pure substances. Equations of state and compressibility factors. General thermodynamic relations- Maxwell’s relation, T-ds equations, Clausius-Claperon equation, the difference in heat capacities, Joule Thompson’s coefficient, Mixtures and solutions, Fugacity and activity coefficients. Thermodynamics of chemical reactions first law and second law analyses of reacting systems. Dissociation and equipment constants. Introduction to phase and chemical equipment.

MEC 521: Manufacturing and Tools Engineering 3 Units
Learning Outcomes:
Upon completing this course, students will be able to:

1. Understand the principles of casting and solidification.
2. Analyze metal forming and machining processes.
3. Evaluate the impact of residual stresses in manufacturing.
4. Study heat treatment and surface hardening techniques.
5. Utilize CAD/CAM tools for tool design and manufacturing.
6. Implement quality control techniques in manufacturing processes.

Manufacturing unit process and material considerations. Casting techniques, solidification and heat flow theory, Defect formation, casting design, metal forming, elementary plasticity theory, plastic failure criteria, forces and work calculations. Power forming techniques; theory and practices of power consolidation, Design considerations. Joining issues: heat flow and defect formation theory, residual stresses. Machining theory and practice. Heat treatment and surface hardening: diffusion residual stresses, machining theory and practice. Heat treatment and surface hardening: diffusion theory, principles of wear resistance. Metrology. Tools engineering: tool materials, plastic mould design, jig and fixture design principles, die design, mechanized assembly, functional ganging—computer-aided machine tool design and control.

MEC 522: Quality and Reliability Engineering 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand international quality standards and regulations.
2. Apply statistical process control methods in production.
3. Evaluate reliability and maintainability of engineering systems.
4. Implement failure analysis and risk assessment techniques.
5. Study accelerated life testing and reliability improvement methods.
6. Develop strategies for continuous quality improvement.

Review of International quality standards. Proactive and reactive quality assurance and control techniques emphasise quality planning, statistical process control, acceptance sampling and total quality management; continuous improvement, statistical process control, leadership; and training—reliability and maintainability engineering issues. Study and application of statistical models and methods for defining, measuring and evaluating reliability of products, processes and services: life distributions, reliability functions, reliability configurations, reliability estimation, parametric reliability models, accelerated life testing, reliability improvement.

MEC 523: Simulation in Engineering 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the fundamentals of simulation modeling.
2. Apply Monte Carlo techniques in engineering analysis.
3. Develop stochastic and deterministic models.
4. Study discrete event simulation for industrial systems.
5. Utilize software tools for system verification and validation.
6. Implement network-based simulation techniques.

Development of the fundamental simulations modelling concept and framework. System-theoretic model development principles and methods, component-based simulation and modelling tools. Simulation experimentation and analysis, Network system simulation modelling, multi-resolution, mult-aspect modelling, Parallel simulation modelling concepts and methods. Simulation model verification and validation. Monte-Carlo techniques and computer usage. Software development. Study the theory and applications of special-purpose simulation languages to model, analyze, and design industrial and engineering systems. Stochastic and deterministic method; discrete event stochastic models. Markov models with application to queuing models.

MEC 524: Facilities Design and Safety Engineering 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand facility design and process engineering principles.
2. Analyze material handling and plant layout optimization.
3. Implement safety regulations in engineering workplaces.
4. Study risk assessment techniques in facility design.
5. Evaluate hazardous material handling and disposal methods.
6. Develop emergency response plans for industrial settings.

Facilities design function, product and process engineering. Flow analysis and design, facility layout using manual and computer routines. Facility location procedures, packaging and material handling system; theory and methods of locating facilities plant and warehouse siting, emergency service sites, vehicle and hazardous material routing, distribution systems design. Planar single and multi-facility models, network location problems, cyclical networks. Design for safety.

MEC 525: Finite Element Analysis 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Understand the fundamental principles of continuum mechanics and finite element methods.
2. Derive and discretize governing equations for problems in solid, structural, and fluid mechanics, as well as in heat and mass transfer.
3. Analyze deformation, strain, and stress using appropriate kinematic measures and constitutive relations.
4. Apply conversion laws and variation principles to develop accurate finite element models.
5. Utilize a general-purpose finite element analysis program to solve central engineering problems.
6. Interpret simulation results and communicate findings effectively through technical documentation.

Basic principles of continuum mechanics and finite element methods, modern application of solution of practical problems in solid, structural and fluid mechanics, heat and mass transfer, and other field problems. Kinematics of deformation, strain and stress measure, constitutive relations, conversion laws, visual work, and variation principles. Discretion governing equations using finite element methods. Solution of central problems using an existing general-purpose finite element analysis program.

MEC 526: Mechatronics Engineering 3 Units

Learning Outcomes:

Upon completing this course, students will be able to:

1. Design and analyze integrated mechatronics and automation systems.

2. Select and integrate appropriate actuators, sensors, hardware, and software for system functionality.
3. Incorporate computer vision techniques into mechatronic system designs.
4. Develop programming and software solutions tailored for mechatronics applications.
5. Model and simulate mechatronic systems to assess performance and validate design concepts.
6. Apply logic control systems, including finite state machine methods and feedback control, to ensure safety and efficiency in automated systems.

Design and analysis of mechatronics and automation systems. Selection and integration of actuators, sensors, hardware, and software. Computer vision. Programming and software design for mechatronics systems. Modelling and simulation. Design of logic control systems. Finite state machine methods. Feedback control and trajectory generation. Safety logic systems. Case studies include automation systems, mobile robots, and unmanned vehicle systems; Design of manipulators, mobile (wheeled) robots, and multi-robotics systems.

EME 500: B.Eng. Degree Project **6 Units**

Learning Outcomes:

Upon completing this course, students will be able to:

1. Select a relevant project topic from areas such as solid and fluid mechanics, material science, machine design, or industrial engineering.
2. Develop a comprehensive research methodology and project plan under academic supervision.
3. Integrate multidisciplinary engineering knowledge to address complex real-world problems.
4. Execute the project through experimental, analytical, or computational methods.
5. Prepare a detailed technical report that documents methodologies, findings, and conclusions.
6. Defend the project outcomes in an oral examination before an External Examiner and the Departmental Board of Examiners.

Each final-year student selects a project from a list of topics drawn from the mechanics of solids and fluids, material science, machine design, heat power, heat transfer, production technology, industrial engineering and management. Each student working under the supervision of an academic staff is required to submit a report on his/her findings and undergo an oral examination by an External Examiner and the Departmental Board of Examiners.