**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

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## 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.

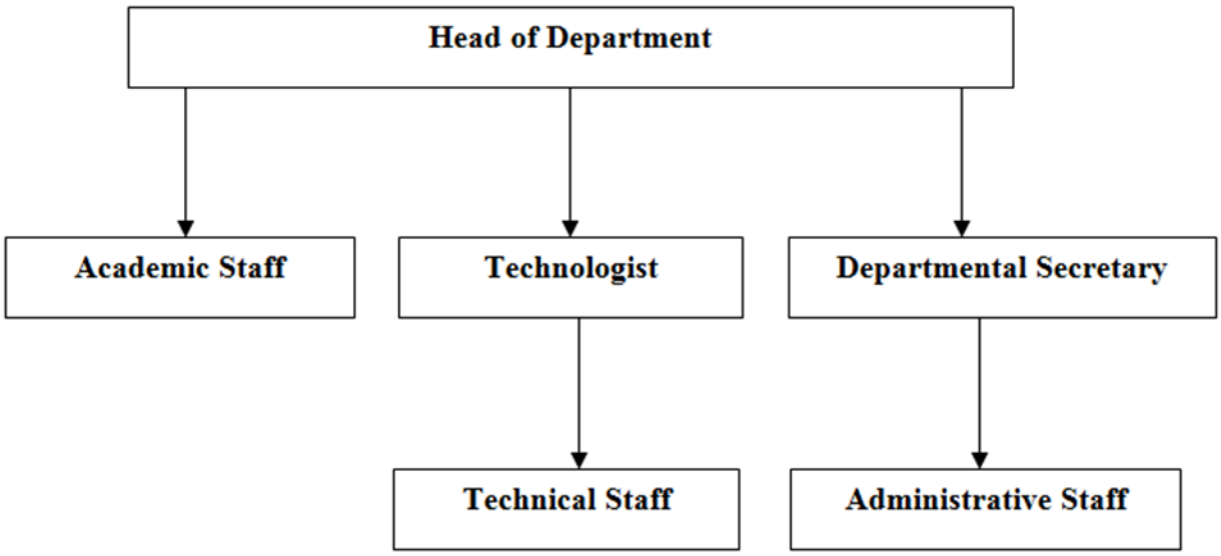


**Figure 1.1: Chart Representing Organizational Structure of the Department**

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. |

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|---|---|---|
| **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. |

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| **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.<br>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 | PO3 (Design and Development of Solutions), PO7 (Environmental and Sustainability Awareness), PO11 (Project Management and |

| | | |
|---|---|---|
| | systems and components. | 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 | Involves open-ended problem-solving, innovative thinking, and adaptability to new challenges. |

| | | |
|---|---|---|
| | solutions. | |
| 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 | With increasing demand for sustainable | Power Systems |

| | | | |
|---|---|---|---|
| | Power Engineering | 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**.** | 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 automobile manufacturing, aircraft maintenance, and electric vehicle technology**.** | Automotive Engineer, Aerospace Engineer, Vehicle Design Engineer and Propulsion Systems Engineer |
| 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 | Engineering Consultant, Start-up Founder (Mechanical Tech-based |

| | | | |
|---|---|---|---|
| | | businesses, or technology startups**.** Others may work as independent consultants providing expertise in design, energy solutions, and automation**.** | 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)** |
|---|---|---|---|
| $C_1$ | $U_1$ | $GP_1$ | $U_1 \times GP_1$ |
| $C_2$ | $U_2$ | $GP_2$ | $U_2 \times GP_2$ |
| - | - | - | - |
| - | - | - | - |
| $C_i$ | $U_i$ | $GP_i$ | $U_i \times GP_i$ |
| - | - | - | - |
| - | - | - | - |
| $C_N$ | $U_N$ | $GP_N$ | $U_N \times GP_N$ |
| TOTAL | **TNU** | | **TUGP** |

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

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 dishonorable, 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 Practical's:

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 practical's 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, Practical's): 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 (GST 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 (GET 429) 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 (GET 429):**

1. **Exclusive Course Registration**

i. Students are allowed to register all the 11 experiential units of SIWES, the two units of GET 402: Engineering Project I and the two units of GET 404: Engineering Valuation will be credited towards the overall assessment for graduation/award of the degree.

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 12 weeks 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 GET 429 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 (MEE 590) 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 (MEE 590)**
    i. Only students who have attained final year status are allowed to register for MEE 590 (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 organized 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 emphasized 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 analyzing 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. All the 11 experiential units of SIWES, the two units of GET 402: Engineering Project I and the two units of GET 404: Engineering Valuation will be credited towards the overall assessment for graduation/award of the degree. 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 (defense) 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 | Expulsion from the University |

| | | |
|---|---|---|
| | committee/panel. | |
| 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

### 6.3.1 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,*

***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*

***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*

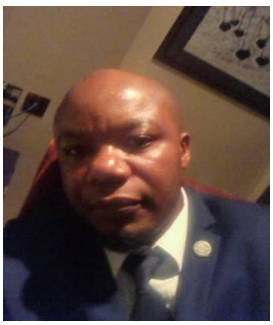
***Name:*** *Julian Chika ARIRIGUZO*

***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*



***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*

***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*

***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*

***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,*

***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*

***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.*

***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*

***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*

***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,*

***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.,*

***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*

***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*

***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*

***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.*

***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,*

***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*

### 6.3.2 Technical Staff

*Ugochukwu OKENWA*

*Chief Technologist*

*Nkemakolam G. ORJI*

*Assistant Chief Technologist*

*Chinonyerem E. CHILAKA*

*Assistant Chief Technologist*

*Kenneth N. UJOATUONU*

*Assistant Chief Technologist*

*Uduma Inya OKORO*

*Principal Technologist 1*

*Vivian C. ANYAEGBU*

*Principal Technologist*

*Samuel E. NWANKWO*

*Senior Technical Officer*

*HND*

## 6.4. COURSE OUTLINE

| 100 LEVEL - FIRST SEMESTER | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Units** | **Status** | **LH** | **PH** |
| GET 111 | Engineer in Society | 1 | C | 15 | - |
| CHM 113 | General Chemistry I | 2 | C | 30 | - |
| CHM 114 | General Practical Chemistry I | 1 | C | - | 45 |
| MTH 112 | Elementary Mathematics I | 2 | C | 30 | - |
| PHY 111 | General Physics I | 2 | C | 30 | - |
| PHY 113 | General Physics III | 2 | C | 30 | - |
| PHY 117 | General Practical Physics I | 1 | C | - | 45 |
| STA 112 | Probability 1 | 3 | C | 45 | |
| GST 111 | Communication in English | 2 | C | 15 | 45 |
| GST 112 | Nigerian Peoples and Culture | 2 | C | 30 | - |

| | | | | | |
|---|---|---|---|---|---|
| LIB 116 | Use of Library | 1 | C | 15 | - |
| IGB 111 | Basic Igbo Literacy | 1 | C | 15 | - |
| *FRE 114 | Elementary French I | 1 | E | 15 | |
| *GER 115 | Elementary German I | 1 | E | 15 | - |
| | **Total** | **20** | | **255** | **135** |
| **100 LEVEL - SECOND SEMESTER** | | | | | |
| **Course Code** | **Course Title** | **Units** | **Status** | **LH** | **PH** |
| MEE 121 | Introduction to Mechanical Engineering | 2 | C | 30 | - |
| GET 121 | Design Thinking and Innovation | 1 | C | 15 | |
| GET 122 | Engineering Graphics & Solid Modeling I | 2 | C | 15 | 45 |
| GET 123 | Engineering Laboratory I | 1 | C | - | 45 |
| CHM 121 | General Chemistry II | 2 | C | 30 | |
| CHM 124 | General Practical Chemistry II | 1 | C | - | 45 |
| MTH122 | Elementary Mathematics II | 2 | C | 30 | - |
| MTH 123 | Elementary Mathematics III | 2 | C | 30 | - |
| PHY122 | General Physics II | 2 | C | 30 | |
| PHY 124 | General Physics IV | 2 | C | 30 | - |
| PHY 127 | General Practical Physics II | 1 | C | - | 45 |
| ENG 121 | Use of English | 1 | C | 15 | |
| IGB 121 | Readings and Practice in Igbo | 1 | C | 15 | - |
| *FRE 124 | Elementary French II | 1 | E | 15 | |
| *GER 125 | Elementary German II | 1 | E | 15 | - |
| | **Total** | **20** | | **240** | **180** |

*** Elective**

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

| 200 LEVEL - SECOND SEMESTER | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Units** | **Status** | **LH** | **PH** |
| MEE 221 | Engineering Metrology | 2 | C | 15 | 45 |
| MEE 222 | Electronics of Mechanical Systems | 2 | C | 15 | 45 |
| GET 221 | Computing and Software Engineering | 3 | C | 30 | 45 |
| GET 222 | Engineering Materials | 3 | C | 45 | - |
| GET 223 | Engineering Mathematics II | 3 | C | 45 | - |
| GET 224 | Strength of Materials | 3 | C | 45 | - |
| GET 225 | Fundamentals of Fluid Mechanics | 3 | C | 45 | - |
| GET 226 | Electrical and Electronics Engineering Laboratory | 1 | C | - | 45 |
| GET 227 | Engineering Laboratory II | 1 | C | - | 45 |
| *GET 229 | SIWES 1 | 3 | C | | 135 |
| | **Total** | **21** | | **240** | **225** |

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

| 300 LEVEL-FIRST SEMESTER | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Units** | **Status** | **LH** | **PH** |
| MEE 311 | Fundamentals of Mechanisms and Machines | 2 | C | 15 | 45 |
| MEE 312 | Mechanical Engineering Design I | 2 | C | 30 | - |
| MEE 313 | Manufacturing Technology | 2 | C | 15 | 45 |
| GET 311 | Engineering Statistics and Data Analytics | 3 | C | 45 | - |
| GET 312 | Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies | 3 | C | 45 | - |
| GET 313 | Engineering Mathematics III | 3 | C | 45 | - |
| GET 314 | Engineering Laboratory III | 1 | C | - | 45 |

| | | | | | |
|---|---|---|---|---|---|
| ENT 312 | Venture Creation | 2 | C | 15 | 45 |
| GST 312 | Peace and Conflict Resolution | 2 | C | 45 | - |
| | **Total** | **20** | | **255** | **180** |
| | **300 LEVEL-SECOND SEMESTER** | | | | |
| **Course Code** | **Course Title** | **Units** | **Status** | **LH** | **PH** |
| MEE 321 | Computer Aided Design and Manufacture (CAD and CAM) | 3 | C | 30 | 45 |
| MEE 322 | Engineering Metallurgy | 2 | C | 15 | 45 |
| MEE 323 | Automotive and Autotronics Engineering | 3 | C | 30 | 45 |
| GET 321 | Engineering Economics | 3 | C | 45 | |
| GET 322 | Technical Writing and Communication | 3 | C | 45 | - |
| GET 323 | Engineering Mathematics IV | 3 | C | 45 | - |
| GET 324 | Renewable Energy Systems and Technology | 3 | C | 30 | 45 |
| *GET 329 | SIWES 1I | 4 | C | - | 180 |
| | **Total** | **20** | | **240** | **180** |

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

**400 LEVEL-FIRST SEMESTER**

| Course Code | Course Title | Units | Status | LH | PH |
|---|---|---|---|---|---|
| MEE 411 | Mechanical Engineering Design II | 3 | C | 45 | - |
| MEE 412 | Mechanics of Machines | 2 | C | 30 | - |
| MEE 413 | Applied Engineering Thermodynamics I | 2 | C | 30 | - |
| MEE 414 | Applied Fluid Mechanics | 2 | C | 30 | - |
| MEE 415 | Heat and Mass Transfer | 3 | C | 45 | - |
| MEE 416 | Advanced Mechanics of Materials | 2 | C | 30 | - |
| MEE 417 | Tool Design | 2 | C | 15 | 45 |
| MEE 418 | Facilities and Work Systems Design | 2 | C | 30 | - |
| | **Total** | **18** | | **255** | **45** |

**400 LEVEL-SECOND SEMESTER**

| Course Code | Course Title | Units | Status | LH | PH |
|---|---|---|---|---|---|
| MEE 421 | Mechanical Engineering Laboratory | 2 | C | - | 90 |
| MEE 422 | Mechanical Building Services | 2 | E | - | 90 |
| MEE 423 | Health Safety and Environment (HSE I & II) | 2 | E | - | 90 |
| GET 421 | Engineering Project I | 2 | C | | 90 |
| GET 422 | Engineering Valuation and Costing | 2 | C | 30 | - |
| *GET 229 | SIWES I | 3 | C | | 135 |
| *GET 329 | SIWES II | 4 | C | | 180 |
| *GET 429 | SIWES III | 4 | C | | 180 |
| | **Total** | **17** | | **30** | **675** |

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

**500 LEVEL-FIRST SEMESTER**

| Course Code | Course Title | Units | Status | LH | PH |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| MEE 511 | Applied Design | 3 | C | 30 | 45 |
| MEE 512 | Modeling and Simulation | 3 | C | 30 | 45 |
| MEE 513 | Nano Technology | 3 | C | 30 | 45 |
| MEE 514 | Applied Engineering Thermodynamics II | 2 | C | 30 | - |
| MEE 515 | Control Systems | 2 | C | 15 | 45 |
| GET 511 | Engineering Project Management | 3 | C | 45 | - |
| GET 512 | Engineering Law | 2 | C | 30 | - |
| *MEE 590 | B.Eng. Project | 6 | C | - | 270 |
| | **Total** | **18** | | **210** | **180** |
| | **500 LEVEL-SECOND SEMESTER** | | | | |
| **Course Code** | **Course Title** | **Units** | **Status** | **LH** | **PH** |
| MEE 521 | Advanced Energy Systems | 2 | C | 15 | 45 |
| MEE 522 | Advanced Manufacturing Processes | 3 | C | 15 | 45 |
| MEE 523 | Industrial Automation and Robotics | 2 | E | 15 | 45 |
| MEE 524 | Reliability Engineering | 2 | E | 15 | 45 |
| MEE 525 | *Refrigeration and Air Conditioning* | 2 | E | 15 | 45 |
| GET 521 | Engineering Management | 3 | C | 45 | - |
| *MEE 590 | B.Eng. Project | 6 | C | - | 270 |
| | **Total** | **18** | | **120** | **450** |

*** MEE 590 credited in the 2nd Semester of 500-Level: Student must register minimum of two (2) final year elective courses**

## 6.5 COURSE SYNOPSIS

**GET 111: Engineer in Society (1 Unit C: LH 15)**

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

**CHM 113: General Chemistry I (2 Unit C: LH 30)**

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

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

Laboratory experiments designed to reflect topics presented in courses CHM 113.These include

acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

**MTH 112: Elementary Mathematics I (Algebra and Trigonometry) (2 Units C: LH 30)**
Elementary set theory, subsets, union, intersection, complements, Venn diagrams. Real numbers, integers, rational and irrational numbers. Mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem, complex numbers, algebra of complex numbers, the argand diagram. De-Moiré's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

**PHY 111: General Physics I (Mechanics) (2 Units C: LH 30)**
Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton's laws of motion (inertial frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits.

**PHY 113: General Physics III (Behaviour of Matter) (2 Units C: LH 30)**
Heat and temperature, temperature scales; gas laws; general gas equation; thermal conductivity; first Law of thermodynamics; heat, work and internal energy, reversibility; thermodynamic processes; adiabatic, isothermal, isobaric; second law of thermodynamics; heat engines and entropy, Zero's law of thermodynamics; kinetic theory of gases; molecular collisions and mean free path; elasticity; Hooke's law, Young's shear and bulk moduli; hydrostatics; pressure, buoyancy, Archimedes' principles; Bernoullis equation and incompressible fluid flow; surface tension; adhesion, cohesion, viscosity, capillarity, drops and bubbles.

**PHY 117: General Practical Physics I (1 Unit C: PH 45)**
treatment of measurement errors. Graphical analysis. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc. (covered in PHY111and 113). However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

**STA 112: Probability I (3 Units C: LH 45)**
Permutation and combination. Concepts and principles of probability. Random variables.
Probability and distribution functions. Basic distributions: Binomial, geometric, Poisson, normal and sampling distributions; exploratory data analysis.

**GST 111: Communication in English (2 Units C: LH 15; PH 45)**
Sounds and sound patterns in English Language (vowels and consonants, phonetics and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Major word formation processes; the sentence in English (types: structural and

functional). Grammar and usage (tense, concord and modality). Reading and types of reading, comprehension skills, 3RsQ. Logical and critical thinking; reasoning methods (logic and syllogism, inductive and deductive argument, analogy, generalization and explanations). Ethical considerations, copyright rules and infringements. Writing activities: pre-writing (brainstorming and outlining). Writing (paragraphing, punctuation and expression). Post- writing (editing and proofreading). Types of writing (summary, essays, letter, curriculum vitae, report writing, note-making) etc. Mechanics of writing. Information and Communication Technology in modern language learning. Language skills for effective communication. The art of public speaking.

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

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

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

Introduction and Historical Background of Libraries: Evolution and significance of libraries, The role of libraries in education and research, The Michael Okpara University of Agriculture, Umudike Library system. Types of Libraries and Their Resources: Academic, public, special, and national libraries, Print and non-print materials, Digital and electronic resources. Library and Education: The relationship between libraries and academic success, Role of the library in self-directed learning, Enhancing research and innovation through libraries. Library Study Skills: Note-taking and summarization techniques, Effective reading and comprehension strategies, Time management for academic success. Library Resources and Organization: Structure of an academic library, Arrangement and classification of resources, The role of librarians in information management. Using Library Resources: Print and Electronic: Accessing books, journals and reference materials, Digital libraries and online repositories, Utilizing institutional e-learning resources. Library Search, Cataloguing and Classification Schemes: The Dewey decimal classification (DDC), The Library of Congress Classification (LCC), OPAC (Online Public Access Catalogue) and other search tools. Databases and Digital Research Tools: Introduction to academic databases (e.g., Google Scholar, JSTOR, ResearchGate, etc.), Open access journals and institutional repositories. Evaluating sources for credibility and reliability. Research Writing and Academic Techniques: Structuring academic papers and reports, Formulating research questions, Literature review techniques. Bibliographic Citation and Referencing Methods: APA, MLA,

Chicago, and Harvard citation styles, Managing citations with software tools (e.g., Mendeley, Zotero, EndNote), The importance of proper referencing in academic writing. Plagiarism and Academic Integrity: Understanding plagiarism and its consequences, Techniques for paraphrasing and summarizing, Ethical considerations in research. Copyright Laws and Intellectual Property Rights: Understanding copyright regulations, Fair use policies and restrictions, Copyright implications in academic research. Conducting Internet and Web-Based Research: Effective internet search strategies, evaluating online sources for accuracy and reliability. The role of artificial intelligence and search engines in research

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

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

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

French Culture and Civilization: Importance of French language in Nigeria, Overview of Francophone countries and their relationship with Nigeria. Knowledge of France: Introduction to France's history and major major cities, Contribution of France to Development of Science, Technology and Agriculture; Medicine and biology; Physics, chemistry and engineering; Agriculture, clothing and Food processing; Mathematics; Arts, communication and Computers; Philosophy. AGRICULTURE (L'AGRICULTURE): Position of France in agricultural produce, Definition of some related agricutral terms, Quelques verbes utilisent dans L'agriculture (Some verbs used in agriculture), Les outils et machines agricols (Some agricultural tools and machines), Some Educational terms in English and French, Some French verbs associated with education, Informatique et la technologie d'information, Verbs associated with ICT. ENGINEERING (GENIE): Genie Chimique (Chemical Engineering), Genie Electrique (Electrical Enginnering), Mechanical Engineering (Genie Mecanique), Génie Civile (Civil Engineering), Les sciences naturelles, Physiques et Appliques (Natural, Physical and Applied Sciences), La Santé et La Médicine (Health and medicine), L'Economie (Economics), Le Tourisme (Tourism). INTRODUCTION A LA PHONETIQUE (INTRODUCTION TO PHONETICS: The French Alphabet and accents, Spellings and pronunciation, Classroom pronunciation practice. LES SALUTATIONS ET FORMULES DE POLITESSE (GREETINGS AND POLITE REMARKS: Common greetings and self-introduction, Asking about Someone's wellbeing, Introduction of Self and others, (Metiers/Professions) Occupation/professsions, Introducing someone (Presenter quelqu'un), Nationality, Address, place and Date of birth, Countries and their nationals, (residential Address) Domicile, (Place of birth) lieu de naissance, Les nombres: cardinaux et ordinaux (Numbers : cardinal and ordinal), (Telling time, Day, Month, Year, and date) Dire L'heure, Les jours, Les mois et les années). LES OBJETS UTILISESS DANS LA CLASSE, ARTICLES, GENRES, PREPOSITIONS (OBJECTS USED IN THE CLASSROOM, ARTICLES, GENDER AND PREPOSTIONS

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

Introduction to German Language, Pronunciation of German alphabets and special characters (ä, ö, ü, ß), Personal pronouns and auxiliary verbs (sein, haben, werden). Greetings and Personal Information, Common greetings and self-introduction, Asking and answering personal details (name, age, nationality, profession). Numbers, Dates and Time, Counting from 0 to 1 billion, Ordinal

numbers and telling time, Days, months, seasons and their significance in agriculture. Articles, Nouns, and Cases, Definite and indefinite articles, Singular and plural forms, Basic introduction to nominative, accusative, dative and genitive cases.

**MEE 121: Introduction to Mechanical Engineering (2 Units C: LH 30)**

Historical development of the mechanical engineering discipline. Philosophy and scope of contemporary mechanical engineering course programme. Overview of mechanical engineering special fields: applied (solid) mechanics, fluid and thermal engineering (thermodynamics and heat transfer). Industrial/production engineering and engineering management sciences. The linkage between mechanical engineering and other engineering disciplines and the sciences. The concept of innovation. Illustrations of a wide variety applications of mechanical engineering. The role of mechanical engineers in the society and human development. Professional ethical responsibility. Climate change, renewable energy and environmental sustainability.

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

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

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

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

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

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

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

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

**CHM 124: General Practical Chemistry II (1 Unit C: PH 45)**
Continuation of CHM 114. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

**MTH 122: Elementary Mathematics II (Calculus) (2 Units C: LH 30)**
Functions of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation, maxima and minima. Extreme curve sketching, integration, definite integrals, reduction formulae, application to areas, volumes (including approximate integration: Trapezium and Simpson's rule).

**MTH 123: Elementary Mathematics III (Vectors, Geometry and Dynamics) (2 Units C: LH 30)**
Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, scalar, multiplication of vectors, linear independence. Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two-dimensional co-ordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normals. Kinematics of a particle. Components of velocity and acceleration of a particle moving in a plane. Force, momentum, laws of motion under gravity, projectiles and resisted vertical motion. Elastic string and simple pendulum. Impulse, impact of two smooth spheres and a sphere on a smooth surface.

**PHY 122: General Physics II (Electricity and Magnetism) (2 Units C: LH 30)**
Forces in nature. Electrostatics (electric charge and its properties, methods of charging). Coulomb‘s law and superposition. Electric field and potential. Gauss‘s law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators. DC circuits (current, voltage and resistance). Ohm‘s law. Resistor combinations. Analysis of DC circuits. Magnetic fields. Lorentz force. Biot-Savart and Ampère‘s laws. Magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances. Faraday and Lenz‘s laws. Step up and step down transformers. Maxwell's equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, and resistance.

**PHY 124: General Physics IV (Vibration Waves and Optics) (2 Units C: LH 30)**
Simple harmonic motion (SHM). Energy in a vibrating system. Damped SHM. Resonance and transients. Coupled SHM. Q values and power response curves. Normal modes. Waves (types and

properties of waves as applied to sound). Transverse and longitudinal waves (superposition, interference, diffraction, dispersion, polarization). Waves at interfaces (energy and power of waves). The wave equation. 2-D and 3-D wave equations. Wave energy and power. Phase and group velocities. Echo and beats. The Doppler-effect. Propagation of sound in gases, solids and liquids and their properties. Optics: Nature and propagation of light. Reflection and refraction. Internal reflection. Scattering of light. Reflection and refraction at plane and spherical surfaces. Thin lenses and optical instruments. Wave nature of light. Dispersion. Huygens's principle (interference and diffraction).

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

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

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

Vocabulary Development: Exploring registers and levels of usage in different fields such as medicine, military, communication, marketing, Law, Literature, Agriculture and Sciences, Direct and indirect speech. Figures of speech: Understanding and application of smile, metaphor, personification, apostrophe, metonymy, synecdoche, hyperbole, climate, euphemism, irony, paradox and oxymoron. Writing Skills: Letter writing - formal, informal, semi- formal, Essay writing, Report writing, Article writing, letters to editors and speech writing techniques. Book Review: A literary book will be assigned at the beginning of the semester. Discussions and reviews to be guided by the instructor. Oral Communication: Introduction to Phonetics and Phonology. ii)Classification of speech sounds: vowels and consonants. Understanding syllables: mono- syllabic, di- syllabic and multi - syllabic words. Mastering stress and intonation patterns. This course is structured to provide students with essential English language skills necessary for academic success and professional communication in their respective disciplines.

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

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

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

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

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

Verbs – Modal, Separable and Inseparable. Modal verbs and their applications. Separable and inseparable verb prefixes. Family, Professions and Descriptive Adjectives. Vocabulary for family structures. Identifying professions and their gender forms. Adjective declension and sentence

construction. The Human Body, Colors and Opposites. Naming body parts and their functions. Understanding and using colors in different contexts. Common antonyms and contrasting words.

**GET 211: Applied Electricity I (3 Units C: LH 30; PH 45)**
Fundamental concepts: Electric fields, charges, magnetic fields. Current, B-H curves Kirchhoff's laws, superposition. Thevenin Norton theorems, Reciprocity, RL, RC, RLC circuits. DC, AC bridges, Resistance, Capacitance, Inductance measurement, Transducers, Single phase circuits, Complex j - notation, AC circuits, impedance, admittance and susceptance.

**GET 212: Engineering Graphics and Solid Modeling II (2 Units C: LH 15; PH 45)**
Projection of lines, auxiliary views and mixed projection. Preparation of detailed working production drawing; semi-detailed drawings, conventional presentation methods. Solid, surface and shell modeling. Faces, bodies and surface intersections. Component-based design. Component assembly and motion constraints. Constrained motions and animation. Introduction to electronics modeling. Electronics board layout preparation, Component libraries and Schematic design. Parametric modeling and adaptive design. Simulation for material optimization. Designing for manufacturing. Additive and subtractive manufacturing. Production for 3-D printing, Laser cutting and CNC machinery. Arrangement of engineering components to form a working plant (Assembly Drawing of a Plant).

**GET 213: Engineering Mathematics I (3 Units C: LH 45)**
Limits, continuity, differentiation, introduction to linear first order differential equations, partial and total derivatives, composite functions, matrices and determinants, vector algebra, vector calculus, directional derivatives.

**GET 214: Applied Mechanics (3 Units C: LH 45)**
Forces, moments, couples. Equilibrium of simple structures and machine parts. Friction. First and second moments of area; centroids. Kinematics of particles and rigid bodies in plane motion. Newton's laws of motion. Kinetic energy and momentum analyses.

**GET 215: Students Workshop Practice (2 Units C: LH 15; PH 45)**
The course comprises general, mechanical and electrical components: supervised hands-on experience in safe usage of tools and machines for selected tasks; Use of measuring instruments (calipers, micrometers, gauges, sine bar, wood planners, saws, sanders, and pattern making). Machine shop: lathe work shaping, milling, grinding, reaming, metal spinning. Hand tools, gas and arc welding, cutting, brazing and soldering. Foundry practice. Industrial safety and accident prevention, ergonomics, metrology. Casting processes. Metal forming processes: hot-working and cold-working processes (forging, press-tool work, spinning, etc.). Metal joining processes(welding, brazing and soldering). Heat treatment. Material removal processes. machine tools and classification. Simple theory of metal cutting. Tool action and cutting forces. Introduction to CNC machines. Supervised identification, use and care of various electrical and electronic components such as resistors, inductors, capacitors, diodes and transistors. Exposure to different electric circuits, wiring schemes, analogue and digital electrical and electronic measurements. Household and industrial energy consumption measurements. Practical energy conservation principles.

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

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

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

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

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

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

**MEE 221: Engineering Metrology (2 Unit C: LH 15; PH 45)**

History of metrology, Advancements in metrology, Gaging methods; Linear, angular, and diameter gaging. Standards and calibration. Non-contact gaging methods and measurement. In-line gaging and data collection, Unit conversions; English-Metric conversion and application, English-Metric Instrumentation, GD&T and inspection; Understanding datum and datum selection, Geometric characteristics and applications, Application modifiers, Interpretation and application of multiple datum control frames, Concepts of gage selection and GD&T; Gage selection process considerations, Gage selection GD&T consideration, Gage selection part configuration, Inspection variables; Thermal impact on inspection, Material stability influence, Part configuration influence, case studies of quality assurance; Quality assurance and control failures, Concepts of non-contact inspection; Lasers, Optical comparators and vision systems, Industrial radiography, Non-destructive testing, Process interface to inspection; Process adjustment and compensation, In-line inspection, Elements of gaging care and calibration; Calibration and Adjustments, Cleaning and Maintenance, Repair and

re-calibration, Elements of quality plans and metrology; Control plan for calibration, Identification and documentation, Traceability.

**MEE 222: Electronics of Mechanical Systems (2 Units C: LH 15; PH 45)**

Introduction to Semiconductor Devices, Diode characteristics, Types of diodes, Transistor characteristics (BJT), Transistor biasing circuits, Transistor switching and amplifiers, Integrator circuits, Operational Amplifiers and application. Open loop and close loop systems, Ideal characteristics, Golden rules, Inverting amplifier, Non Inverting amplifier, Summing amplifier, Differentiating amplifier, Differential amplifier, Integrator amplifier, Unity gain amplifier. Field Effect Transistor (FET) characteristics and applications, Logic circuits and their application. DC power supply, Rectification, Smoothing and voltage stabilization, Ripple factor and efficiency**.** Electrical coupling and impedance matching, Power converters (Single-phase and 3-phase rectifiers and inverters).

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

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

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

Basic material science; atomic structure, atomic bonding and crystal structures. Engineering materials situating metals and alloys; metals and alloys, classifications of metals, metal extraction processes using iron and steel (ferrous) and aluminium (nonferrous) as examples, phase diagrams/iron carbon diagrams, and mechanical workings of metals. Selection and applications of metals and alloys for specific applications in oil, aerospace, construction, manufacturing and transportation industries, among others. Ceramics (including glass); definition, properties, structure and classifications of ceramics. Bioactive and glass – ceramics. Toughing mechanism for ceramics. Polymers; definition of polymers as engineering materials, chemistry of polymeric materials, polymer crystallisation, polymer degradation and aging. Thermoplastic and thermosetting polymers and concepts of copolymers and homopolymers. Composites; definition, classification, characterisation, properties and composite. Applications of composites. Nanomaterials; definition, classification and applications of nanomaterials as emerging technology. Processing of nanomaterials including mechanical grinding, wet chemical synthesis, gas phase synthesis, sputtered plasma processing, microwave plasma processing and laser ablation. Integrity assessment of engineering materials; effect of engineering design, engineering materials processing, selection, manufacturing and assembling on the performance and service life of engineering materials. Metallography and fractography of materials. Mechanical testing (destructive testing) of materials such as compressive test, tensile test, hardness test, impact test, endurance limit and fatigue test. Non-destructive test (NDT) such as dye penetrant, x-ray and eddy current.

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

Introduction to ordinary differential equations (ODEs); theory, applications, methods of solution; second order differential equations. Advanced topics in calculus (vectors and

vector-valued function, line integral, multiple integral and their applications). Elementary complex analysis including functions of complex variables, limits and continuity. Derivatives, differentiation rules and differentiation of integrals. Cauchy-Riemann equation, harmonic functions, basic theory of conformal mapping, transformation and mapping and its applications to engineering problems. Special functions.

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

Consideration of equilibrium; composite members, stress-strain relation. Generalised Hooke's law. Stresses and strains due to loading and temperature changes. Torsion of circular members. Shear force, bending moments and bending stresses in beams with symmetrical and combined loadings. Stress and strain transformation equations and Mohr's circle. Elastic buckling of columns.

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

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

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

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

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

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

**GET 229: Students Industrial Work Experience I (3 Units C: PH 135)**

Practical experience in a workshop or industrial production facility, construction site or special centres in the university environment, considered suitable for relevant practical/industrial working

experience but not necessarily limited to the student's major. The students are exposed to hands-on activities on workshop safety and ethics, maintenance of tools, equipment and machines, welding, fabrication and foundry equipment, production of simple devices; electrical circuits, wiring and installation, etc. (8-10 weeks during the long vacation following 200 level).

**MEE 311: Fundamentals of Mechanisms and Machines (2 Units C: LH:15: PH: 45)**

Introduction, Mechanical Science, Mechanical Joints, Degrees of Freedom, Inverse and Forward Problems, Kinematic Analysis, Force Analysis, Mathematical Preliminaries, Organization and Notations of the Lecture Notes, Position Analysis, Coordinate Transformation, Point Trajectories, Motion Constraints, Inverse Problem, Classical Kinematic Approach, Analysis of the Four-Bar Mechanism, Algebraic Constraint Equations, Velocity and Acceleration Analysis; Vector and Matrix Identities, Velocity Equations, Point Trajectories, Acceleration Equations, Inverse Problem, Classical Kinematic Approach, Graphical Approach, Motion of a Point on a Rigid Body, Singular Configurations, Algebraic Constraint Equations, Motion Transmission: Cams and Gears, Cams, Cam Displacement Diagram, Design of the Cam Profile, Cam Displacement Functions, Standard Cam Displacement Functions, Gears, Fundamental Law of Gearing, Involute Curve, Spur Gear Geometry and Design, Gear Trains, Epicyclic (Planetary) Gear Trains, Dynamics of Mechanisms and Machines; Newton-Euler Equations, D'Alembert's Principle, Computational-Dynamics Approach, Balancing, Spatial Kinematics, Euler Angles. Velocity and Acceleration Vectors, Spatial Newton-Euler Equations**.**

**MEE 312: Mechanical Engineering Design I (2 Units C: LH 30)**

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, 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 drawing. 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 on production, operation and maintenance

**MEE 313: Manufacturing Technology (2Units C: LH 30; PH: 45)**

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, chippless material removal processes. Introduction of automation in manufacturing visualization fixtures. Machine tool installation, testing and maintenance. Workshop practicals based on topics covered. Foundry Practice: Pattern making, moulding, melting and pouring. Principles of solidification of metals and alloys, Design of gates and risers. Castings

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

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

**GET 312: Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies (3 Units C: LH 45)**

Concepts of human and artificial intelligence; artificial/computational intelligence paradigms; search, logic and learning algorithms. Machine learning and nature-inspired algorithms – examples, their variants and applications to solving engineering problems; understanding natural languages; knowledge representation, knowledge elicitation, mathematical and logic foundations of AI; expert systems, automated reasoning and pattern recognition; distributed systems; data and information security; intelligent web technologies; convergent technologies – definition, significance and engineering applications. Neural networks and deep learning. Introduction to python AI libraries.

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

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

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

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

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

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro-finance, personal

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

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

The concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, economic, geo-political Conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory; root causes of conflict and violence in Africa: indigene and settlers phenomenon, boundaries/boarder disputes, political disputes, ethnic disputes and rivalries, economic inequalities, social disputes, nationalist movements and agitations; selected conflict case studies – Tiv-Junkun, ZangoKartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security: Peace & Human Development. Approaches to Peace & Conflict Management (religious, government, community leaders). Elements of peace studies and conflict resolution: Conflict dynamics assessment Scales: Constructive & Destructive. Justice and Legal framework: Concepts of Social Justice; The Nigeria Legal System. Insurgency and terrorism. Peace mediation and peace keeping. Peace and Security Council (international, national and local levels). Agents of conflict resolution – Conventions, Treaties Community Policing: Evolution and Imperatives. Alternative Dispute Resolution (ADR) (dialogue,. arbitration, negotiation, collaboration, etc). The roles of international organizations in conflict resolution ((a) The United Nations, UN and its conflict resolution organs. (b) The African Union & Peace Security Council (c) ECOWAS in peace keeping). The media and traditional institutions in peace building. Managing post-conflict situations/crises: Refugees. Internally Displaced Persons (IDPs); the role of NGOs in post-conflict situations/crises.

**MEE 321: Computer-Aided Design and Manufacture (3 Units C: LH 30; PH 45)**

Introduction to computer aided design (CAD). Basic data structuring technique. Computer graphics. Geometric transformation techniques. Mathematical bases for surface modeling: curves, surfaces and solids. Principles of solid modeling and application. CAD software. Introduction to CAM: Relation between production volume and flexibility. Various manufacturing systems – batch, mass, group, cellular and flexible manufacturing systems. Type of automation and benefits of soft or flexible automation. Automation in material handling and assembly. CNC machines: Introduction, classification, design and control features including interpolations. Numerical control and NC part-programming. Introduction to Robotics: Definitions, motivation, historical development. Basic structure, classification, workspace, drives, controls, sensors, grippers, specifications. Manual CNC programming (milling and turning). Basic and advanced CAD/CAM for CNC (milling and turning). Group project assignment.

**MEE 322: Engineering Metallurgy (2 Units C: LH 15; PH 45)**

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; aluminum, 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**.**

**MEE 323: Automotive and Autotronics Engineering (3 Units C: LH 30; PH 45)**

This course introduces students to internal combustion engines, their efficiency and pollutants emission. It looks at the various emerging power technologies in the automotive industry and the current and alternative fuels and combustion processes. Choice of fuel and the design of efficient engine operating parameters and their by-products will also be discussed. Theory and practical works on automotive body work techniques: wheel balancing and alignment, routine maintenance, auto fault finding/trouble-shooting techniques and rectification procedures, test and performance analysis of auto systems. Body and chasis design. Introduction to Autotronics; Electronic engine and vehicle motion control systems; Design of algorithms/programs for treatment of automotive engineering problems. 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. Evolution of electronics in automobiles – emission laws – introduction to Euro I, Euro II, Euro III, Euro IV, Euro V standards – Equivalent Bharat Standards. Ignition systems: Ignition fundamentals - Electronic ignition systems – Programmed Ignition – Distribution less ignition - Direct ignition – Spark Plugs. Electronic fuel Control: Basics of combustion – Engine fuelling and exhaust emissions – Electronic control of carburetion – Petrol fuel injection – Diesel fuel injection. Charging systems: Working and design of charging circuit diagram – Alternators– Requirements of starting system - Starter motors and starter circuits. Working principle and characteristics of Airflow rate, Engine crankshaft angular position, Hall effect, Throttle angle, temperature, exhaust gas oxygen sensors –study of fuel injector, exhaust gas recirculation actuators, stepper motor actuator, vacuum operated actuator. Control modes for fuel control-engine control subsystems – ignition control methodologies – different ECU‟s used in the engine management – block diagram of the engine management system. In vehicle networks: CAN standard, format of CAN standard – diagnostics systems in modern automobiles. Traction control system – Cruise control system – electronic control of automatic transmission – antilock braking system – electronic suspension system – working of airbag and role of MEMS in airbag systems – centralized door locking system –climate control of cars.

**GET 321: Engineering Economics (3 Units C: LH 45)**

The nature and scope of economics. Basic concepts of engineering economy- Relationship between Science, Engineering, Technology and Economics. Theories of Maximization-Profit Maximization, Growth Maximization, Sales Revenue Maximization, Utility Maximization and Wealth Maximization. Theory of Demand-Demand schedule, Nature and characteristics of demand, Law of demand, Limitations to the law of demand, Elasticity of Demand: Price, Income and Cross elasticity, Demand Forecasting definition, factors determining demand forecasting, methods of demand forecasting. Cost Concepts-Types of costs: Fixed cost, Variable cost, Average cost, Marginal cost,

Real cost, Opportunity cost, Accounting and Economic cost, Cost - Volume profit analysis, Break - Even analysis, Operating leverage. Interest formulae, discounted cash flow, present worth, equivalent annual growth and rate of return comparisons. Replacement analysis. Benefit-cost analysis. Minimum acceptable rate of return. Acccounting Concepts-Double Entry system, Journal, Ledger, Trail balance, Final Accounts Book Keeping system, Depreciation - Definition, functions, methods of depreciation; Straight line, Declining balance; Sum of years digits method. Judging attractiveness of proposed investment.

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

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

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

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

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

Current and potential future energy systems in Nigeria and globally - resources, extraction, concepts in energy conversion systems; parallels and differences in various conversion systems and end-use technologies, with emphasis on meeting 21st-century national, regional and global energy needs in a sustainable manner. Various energy technologies in each fuel cycle stage for fossil (oil, gas, synthetic), nuclear (fission and fusion) and renewable (solar, biomass, wind, hydro, and geothermal). Energy types, storage, transmission and conservation. Analysis of energy mixes within an engineering, economic and social context. Sustainable energy; emphasise sustainability in general

and in the overall concept of sustainable development and the link this has with sustainable energy as the fundamental benefit of renewable energy.
Practicals**:** Simple measurement of solar radiation, bomb calorimeter determination of calorific value of fuels and biomass; measurement of the velocity of wind, waves and the energy that abound in them; laboratory production of biogas and determination of energy available in it; simple conversion of solar energy to electricity; trans-esterification of edible oil into biodiesel; simulation of geothermal energy; Geiger-Muller or Scintillation Counters' determination of uranium or thorium energy; simple solid or salt storage of energy; hybrid application of renewable energy.

**GET 329: Students Industrial Work Experience II (4 Units C: PH 180)**
On-the-job experience in industry chosen for practical working experience but not necessarily limited to the student's major (Students are to proceed on three months of work experience i.e. 12 weeks during the long vacation following 300 level). Students are engaged in the more advanced workshops, indoor software design training similar to what they will use in the industry and outdoor construction activities to sharpen their skills. The use of relevant animation videos that mimic industrial scenarios is encouraged. Students are to write a report at the end of the training. As much as possible, students should be assisted and encouraged to secure 3 months placement in the industry. Examples of outline of activities and experiences to which students are expected to be exposed to earn prescribed credits include:
Section A: Welding and fabrication processes, automobile repairs, · lathe machine operations: machining and turning of simple machine elements, such as screw threads, bolts, gears, etc. Simple milling machine operations, machine tool maintenance and trouble-shooting, and wooden furniture making processes.

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

Examples of projects should include the following:

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

**MEE 411: Mechanical Engineering Design II (3 Units C: LH 45)**
Journal bearings. Application of Hertz stress theory. Fluid couplings. Lubrication mechanics: hydrodynamic theory applied to tapered wedge and journal bearings and hydrostatic lubrication applied to journal bearings. Gears and power transmission systems. Elements of fluid power system design. Design of cylinders, pipes and pipe joints, tubes, plates and flywheel. Seals, packaging, gaskets and shields. Failure analysis; various types of joints, design of machine elements; system design, design of gear systems; material selection in design; design; design and production matching; optimization in design D.

**MEE 412: Mechanics of Machines (2 Units C: LH 30)**

Force analysis of mechanisms, fluctuation of kinetic energy and inertial effects. Complete static and dynamic analysis. Flexible shaft couplings: belt, rope and chain drives. The flywheel and mechanical governors. Brakes and dynamometers. Balancing of multi-cylinder engines. Balancing of machinery. Vibration of machinery; free and forced vibration, damping, natural frequencies and critical speeds. Transverse vibrations of beams, whirling of shafts and torsional vibrations problems.

**MEE 413: Applied Engineering Thermodynamics I (2 Units E: LH 30)**

Vapour compression cycle; Entropy; Clausius's Inequality; Tds relationship; Entropy of closed system; control volume isentropic process; Rotary compressors – centrifugal and axial-flow; stagnation properties. Rankine cycle with superheat and reheat; Regenerative vapour cycles; Gas Power systems: Simple gas turbine Regenerative as cycles; The steam power plant. Simple gas turbine plant; Exergy – Definition, equation of state, analysis, exergy balance of a closed system; Multistage reciprocating compressors. Combustion of fuels; chemistry of common hydrocarbon fuels, combustion with deficiency or excess air. Thermochemistry: Hess' Law of Heat Summation; heats of combustion and reaction; ideal adiabatic flame temperature. Reciprocating internal combustion engines. Otto cycle; General thermodynamics relations. Kinetic theory of gas. Mixture of gases. Introduction to heat transfer.

**MEE 414: Applied Fluid Mechanics (2 Units C: LH 30)**

Dimensional analysis and similitude; Kinematics and Dynamics of fluid motion; Continuity equation – momentum, annular momentum and energy equations; Euler and Bernoulli equations; Incompressible fluid between parallel plates, circular tubes and circular annuli; Laminar and turbulent flow in pipes, Fluid pressure and measurements – velocity and flow rates; Unsteady flow; Oscillation in U-tube; surge tank; water hammer. Open-channel flows. Introductory concepts of boundary layer and re-circulating flows, mathematical derivation of Navier-stokes equations and its application. Introduction to turbo machinery; characteristic curve for axial-flow and centrifugal pumps, fans, blowers, impulse and reaction turbines. Fluid couplings and lubrication mechanics; bearings; Lift and Drag principle; Boundary layer theory; Pump selection and application. Pipeline systems (Series and Parallel). Compressible flow; flow through heat exchange; Open channel flow. Overview of computational fluid dynamics (CFD).

**MEE 415: Heat and Mass Transfer (3 Units C: LH 45)**

Conduction and Convection heat transfer: Newton's and Fourier's Laws of heat transfer, general heat conduction equation, steady state conduction in one dimension, conduction and convention in three cartesian coordinates across plates, circular and cylindrical planes; heat transfer coefficients; Energy equation of convection. Continuity and momentum equations and their roles in convection heat transfer analysis. Convection heat transfer in laminar and turbulent flows. Internal and external flows. Heat transfer coefficients. Dimensional analysis and dimensionless groups in convection heat transfer. Convection heat transfer correlations. Heat exchanger analysis and design; Logaritmic mean temperature; Radiation: intensity; Stefan-Boltzman law, Black and gray bodies, emission and absorption, Combined modes of heat transfer. Mass transfer: Mechanisms of mass transfer. Fick's law of mass diffusion. General diffusion law. Rate equations. Comparison of Fick's and Fourier's laws. Equations of mass transfer in stationary systems. Similarities between conduction and mass transfer in stationary systems. Mass transfer coefficient. Electrical analogy of mass transfer. Equimolal counter diffusion. Drying and humidification of solids and gases. Types of dryers. Evaporation. Mass transfer correlations in convective systems.

**MEE 416: Advanced Mechanics of Materials (2 Units C: LH 30)**

Thick cylinders; compound cylinders. Rotating disks. Bending of flat plates. Beams on an elastic foundation. Membrane stresses in shells of revolution. Two-dimensional theory of elasticity. Elastoplastic problems and limit theory.

**MEE 417: Tool Design (2 Units C: LH 30:PH 45)**

Tool Design, Materials Used for Tooling, Cutting Tool Design, Workholding Concepts, Jig Design, Fixture Design, Power Presses, Die Design and Operation, Inspection and Gage Design, Tool Design for Joining Processes, Modular and Automated Tool Handling, Computer Applications in Tool Design. Geometric Dimensioning and Tolerancing

**MEE 418: Facilities and Work Systems Design (2 Units C: LH 30)**

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. Productivity, effect of productivity and standard of living and economic development. Techniques for increasing productivity; work study and its advantages. Basic procedure for method of study, use of charts and symbols; factory/shop layout; 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, wise, 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) standard of living. Group technology tasks involving improvement on the productivity of systems.

**MEE 421: Mechanical Engineering Laboratory (1 Unit C: PH 45)**

Laboratory sessions involving topics covered in MEE 413, MEE 414, MEE 415 and MEE 416

**MEE 422: Mechanical Building Services (1 Units: C; PH 45)**

Introduction to building services. Mechanical building services: water supply; plumbing and drainage; heating, ventilation and air conditioning (HVAC) systems, fire protection systems, etc. Building maintenance management. Regulatory and professional practices related to both design and maintenance of buildings.

**MEE 423: Health Safety and Environment (HSE I &II) (2 Units: C; PH 90)**

HSE I: Introduction to HSE (Overview of HSE in engineering practices, Importance of HSE in engineering projects, HSE regulations and standards). Hazard Identification and Risk Assessment (Hazard identification techniques, Risk assessment methodologies, Hazard control and mitigation measures). HSE Management Systems (HSE management system framework, Policy, planning, and implementation, Monitoring, review, and continuous improvement). Occupational Health and Safety (Occupational health hazards, Safety management systems, Emergency response planning)

HSE II: Environmental Impact Assessment (Environmental impact assessment methodologies, Environmental legislation and regulations, Sustainable development principles). Waste Management and Pollution Control (Waste management strategies, Pollution control measures, Environmental monitoring and reporting). Fire Safety and Emergency Response (Fire safety principles, Fire risk

assessment and management, Emergency response planning and procedures). Case Studies and Group Projects (Real-life case studies of HSE in engineering projects, Group projects on HSE management systems and emergency response planning).

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

In the second semester of the 400-level students, preferably in groups, work from the University on the identified industry or organization to tackle industry complex engineering problems. Theoretical issues may be provided by the department faculty or industry experts. During the vacation, students will now work full time with the organisation/industry on the project as part of the SIWES III. The students can also go beyond the department and engage in multidisciplinary undertakings. Literature survey, review of existing systems etc. must be achieved to a satisfactory extent.

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

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

**GET 429: Students Industrial Work Experience III (4 Units C: PH 180)**

On-the-job experience in industry chosen for practical working experience but not necessarily limited to the student's major (24 weeks from the end of the first semester at 400-Level to the beginning of the first semester of the following session. Thus, the second semester at 400-Level is spent in industry). Each student is expected to work in a programme related industry, research institute or regulatory agencies etc., for a period of 6 months under the guidance of appropriate personnel in the establishment but supervised by an academic staff of the Department. On completion of the training, the student submits the completed Log book on the experience at the establishment., Also, there will be a comprehensive report covering the whole of the student's industrial training experiences (GET 229, GET 329 and GET 429), on which a seminar will be presented to the Department for overall assessment.

**MEE 511: Applied Design (3 Units C: LH 30; PH 45)**

Scientific Design Methodology: creative application of the design process to engineering problems with emphasis on the manufacture of complete systems to accomplish overall objectives of minimum weight, high efficiency while satisfying the design constraints. An appreciation of the process of engineering design, and of systematic procedures and tools usable in the design process, with particular reference to mechanical systems and devices. Topics include systematic problem definition, search for possible solutions, statistical analysis of stress/strength interference, experiment planning techniques, optimum design for minimum weight and cost, and management of the design process. Design Project: Students will be required to conduct a design project under supervision, using the presented techniques, and taking at least to a workable layout drawing of a device. The design should involve simple mechanical systems (e.g. testing and assembling devices, heat drive, etc.) for a specified duty, analyse its operating conditions and after considering the design criteria, choose between potential solutions. Reports submitted by students should contain all calculations, a comparison of potential solutions, justification for the design finally chosen, and instructions on detail

design, manufacture, testing and use. Use and evaluation of several CAD/CAM software packages. Students will gain experience with CAD/CAM software while carrying out an actual manufacturing design project.

**MEE 512: Modeling and Simulation (3 Units C: LH 15; PH 45)**

Development of the fundamental simulations modeling concept and frame work. System-theoretic model development principles and methods, component-based simulation and modeling tools. Simulation experimentation and analysis, Network system simulation modeling, multi-resolution, multi-aspect modeling, Parallel simulation modeling concept and methods. Simulation model verification and validation. Monte-Carlo techniques and computer usage. Software development. Study of 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.

**MEE 513: Nano Technology (3Units C: LH 30; PH: 45)**

Fundamental concepts in nano-science and Nano technology. Review of quantum mechanics. Nano-systems. Molecular dynamics. Scanning probe microscopy. Nano-materials. Production and characterization of nanoparticles. Design of nanostructured systems. Nano-mechanics of materials, Applications of nano-systems in the industry. Carbon Nano fibres, Nano-composites.Fabrication methods. Computational nanotechnology.

**MEE 514: Applied Engineering Thermodynamics II (2 Units C: LH 30; PH 45)**

Non-ideal pure substances. Equations of state and compressibility factors. General thermodynamic relations-Maxwell's relation, T-ds equations, Clausius-Claperon equation, 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; Practical cycles: refrigerants vapour compression, gas, water and absorption cycles. Design methods; refrigeration loads, equipment selection. Refrigeration and Air conditioning processes; Psychometrics: Psychometric process, analysis-using psychometric charts. Cooling and Load calculations, Air-condition design, equipments selection and evaluations: ducts, fan throttling systems and Physiological principles and comfort indices, relative humidity, wet bulb temperature. Introduction to Food refrigeration and Cryogenics.

**MEE 515: Control Systems (2 Units C: LH 30; PH 45)**

Historical development of automatic control. Control systems; open and closed-loop control systems, characteristic of feedback, control media and control system components. Digital systems. Mathematical modeling of control systems. Transfer functions, block diagrams and signal flow graph. Time domain analysis, transient response, steady-state error, stability and sensitivity. Routh's stability criterion. Root locus. Frequency domain analysis, Ny-quist 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, hybrid feedback control systems. Control systems of power plants.

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

Project management fundamentals – definitions, project environment, nature and characteristics, development practice, management by objectives, and the centrality of engineering to projects, infrastructures, national and global development. The scope of project management – organizational, financial, planning and control, personnel management, labour and public relations, wages and salary administration and resource management. Identification of project stakeholders; beneficiaries and impacted persons – functions, roles, responsibilities. Project community relations, communication and change management. Project planning, control and timeliness: decision making, forecasting, scheduling, work breakdown structure (WBS), deliverables and timelines, logical frameworks (log frames), risk analysis, role of subject matter experts (SMEs), role conflicts; Gantt Chart, CPM and PERT. Optimization, linear programming as an aid to decision making, transport and materials handling. Monitoring and Evaluation – key performance indices (KPIs); methods of economic and technical evaluation. Industrial psychology, ergonomics/human factors and environmental impact considerations in engineering project design and management. Project business case - financial, technical and sustainability considerations. Case studies, site visits and invited industry professional seminars. General principles of management and appraisal techniques. Breakthrough and control management theory; production and maintenance management. Training and manpower development. The manager and policy formulation, objective setting, planning, organizing and controlling, motivation and appraisal of results.

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

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

**MEE 521: Advanced Energy Systems (2 Units C: LH 15; PH 45)**

Advanced energy conversion technologies: Natural gas combined cycle, alternatively-fueled combined cycle (i.e., coal or biomass in integrated gasification combined cycle), supercritical Rankine cycle, biomass combustion systems, nuclear, and fuel cells, fossil fuels, renewable energy and advanced energy materials. Energy storage systems. Energy systems analysis, modeling and optimization**:** Availability analysis approach, Determination of extractable maximum possible work from energy resource, optimization of complex energy systems that work potential is destroyed by irreversibility based on idea that all energy resources have the potential to do work by virtue of being out of equilibrium (thermal, mechanical and chemical) with the environment, Application of AI/machine learning and smart grids to energy system performance optimization, Energy efficiency and demand response strategies**.** Energy Policy and Regulations**.** Sustainable energy development for electric power generation, transportation, emissions reduction, carbon capture, utilization and storage.

**MEE 522: Advanced Manufacturing Process (3Units C: LH 30; PH 45)**
Non-traditional machining, Additive manufacturing, Rapid prototyping and tooling, Micro and nano fabrication technologies, Manufacturing process modelling, simulation, selection and optimization, Lean manufacturing and Six Sigma. Practical sessions: Hands-on experience with different types manufacturing equipment, CAD/CAM software for designing and preparing parts for manufacturing and CNC programming for controlling automated manufacturing machines

**MEE 523: Industrial Automation and Robotics (2 Units C; LH 15; PH 45)**
Economics of Automation. Flow Lines and Mathematical Models; Storage Buffers and Partial Automation; Balancing Techniques. Group Technology and Flexible Manufacturing Concepts. Introduction to PLCs and Their Advantages, and Ladder Logic Diagrams and Switching Logic. PLC Data Communication and Human Machine Interfaces (HMI). PLC Connection and Operation. PLC Numbering and Addressing. General Information and Operations of CNC machines, including Control Panel Descriptions and Tool Functions. Practical Application of Tool Wear Offset, Feed Function, and Spindle Function. CNC Program Creation and Preparatory Functions. Computer-Assisted Part Programming and APT Programming System. CAD/CAM Approach to Part Programming and Applications (Turning, Surface Milling, Machining of Curved Surfaces).

**MEE 524: Reliability Engineering (2 Units E: LH 15; PH 45)**
Review of international quality standards (ISO 9000, etc.). Proactive and reactive quality assurance and quality control techniques; emphasis on quality planning, statistical process control (SPC), acceptance sampling and total quality management (TQM). Introduction to reliability and maintainability engineering. Study and application of statistical models and methods for defining, measuring, and evaluating reliability of products, processes, and services; emphasis on reliability functions (e.g., failure rate, mean time to failure), reliability configurations (e.g., series, parallel, complex systems), reliability estimation (e.g., parametric, non-parametric methods), reliability improvement techniques. Continuous improvement techniques for quality and reliability; Leadership and training issues in quality and reliability engineering; emphasis on statistical process control (SPC) for continuous improvement, total quality management (TQM) principles, leadership styles and strategies for quality and reliability improvement, Training and development programs for quality and reliability engineers

**MEE 525: Refrigeration and Air conditioning (2 Units E: LH 15; PH 45)**
Refrigeration and Air conditioning processes; Psychometrics: Psychometric process, analysis-using psychometric charts. Cooling and Load calculations, Air-condition design, equipments selection and evaluations: ducts, fan throttling systems and Physiological principles and comfort indices, relative humidity, wet bulb temperature. Introduction to Food refrigeration and Cryogenics. Steam piping and heating systems.

**GET 521: Engineering Management (3 Units C: LH 45)**
Essence of management task. Patterns of leadership. Creating a viable organization. Productivity and motivation, organizing task. The span of control and the delegation of authority. Organizational theory and concepts. Industrial safety. Industrial relations. Technology innovation and sustainability: Change, Risk, Logistic and Supply Chain management. Application of industrial engineering tools to solve health care delivery problems focused on cost reduction and quality improvement by facility and process redesign and systems integration. Operational specialties integration in a project

consulting firm. Group technology tasks involve designing, planning and implementing an engineering project to stimulate students' multidisciplinary teams' working ability or application of industrial engineering tools in evaluating and solving any practical organizational problem.

**MEE 590: B.Eng. Project (6 Units C: LH/PH 270)**

Final-year projects are assigned at the beginning of each academic year. Each final year student chooses a project supervisor in consultation with the final-year project coordinator. The process is entirely interactive, but the coordinator ensures that there is an even distribution of students amongst the lecturers. The final topic is decided by the student and his supervisor, selected from the fields of mechanics of solids and fluids, materials science, machine design, heat power, heat transfer, production technology, industrial engineering and management. Each student presents at least two seminars as part of their final year project, usually at the beginning and ending of the second semester. Each student is required to submit a report of their findings and undergo an oral examination. All seminars are scored by a panel of lecturers.