DEPARTMENT OF MECHANICAL ENGINEERING

SCHOOL OF INFRASTRUCTURE, PROCESS ENGINEERING AND TECHNOLOGY

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

COURSE LEARNING OUTCOMES (CLOs)

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Course Code: MEE 212 (3 Units; Core; L = 45) C**ourse Title:** Applied Mechanics

Contact Hour: 3 Hours per week **Pre-requisite:** Nil

Contact Venue: Mon, 8 – 11am, LT I and LT II **Semester:** First

Lecturers in-charge: Engr. Prof. O. A. Olugboji and Engr. Dr. I. C. Ugwuoke

Course Overview

Applied Mechanics is a foundational course designed to equip students with the principles and applications of mechanics in engineering. This course focuses on the analysis of forces and the motion of particles and rigid bodies. Students will learn to apply these principles to solve real-world engineering problems, emphasizing both theoretical understanding and practical application.

Course Contents

Static's: Laws of static's, system of forces in equilibrium and resultant forces. Applications to simple engineering problems: Friction: Friction Laws, coefficient of friction, friction on horizontal and inclined planes. Particle dynamics: Kinematics and kinetics of particles, kinematics of plane motion. Newton's laws of motions, momentum and energy methods. Mass, moment of inertia to simple common engineering shapes. Kinematics of rigid bodies. Two dimensional motions of rigid bodies, energy and momentum. Simple harmonic motions, as a to and fro motion. Harmonic motion as a projection of a point, moving on a circle. Free undamped vibration of a mass-spring systems: in translation and torsion, such as simple and compound pendulums

Recommended Texts

1. Ansel C. Ugural & Saul K. Fenster**. Advanced Mechanics of Materials and Applied Elasticity" (6th Edition)**
2. Ferdinand Beer, E. Russell Johnston Jr., & David Mazurek. **Vector Mechanics for Engineers: Statics and Dynamics" (12th Edition)**
3. Russell C. Hibbeler. **Engineering Mechanics: Dynamics" (15th Edition)**.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Study of force systems, moments, equilibrium of particles and rigid bodies, structures (trusses, frames, and machines), and friction	1,2	2	Assignment, Exams
CLO2	Analyze the basic principles of mechanical vibrations and their control in engineering systems.	2,3	4	Assignment, Exams
CLO3	Understand and describe the mechanical behavior of materials under various loading conditions	1,2,3	5	Assignment, Exams
CLO4	Analyze stress and strain in materials and understand their relationship	2,4	3	Assignment, Exams
CLO5	Evaluate and solve problems related to the bending of beams.	1,2	2	Assignment, Exams
CLO6	Apply principles of dynamics to analyze the motion of particles and rigid bodies.	2,4	5	Assignment, Project, Exams
CLO7	Demonstrate a clear understanding of the basic principles and theories of applied mechanics.	1,2	2	Project, Exams
CLO8	Understand the basic principles of fluid mechanics and their application in real-world problems	2,3	4	Assignment, Exams
CLO9	Construct shear force and bending moment diagrams for various types of loads and supports.			Assignment, Exams

Grading Standard

- Assignments: 10 %
- Project: 10 %
- Continuous Assessment: 20 %
- Semester Examination: 60 %

Course: EET 214 **Course Title**: Fundamentals of Fluid Mechanics

Course Unit(s): Two (2) **Time**: 2 hours Contact Time per Week

Semester: First **Location**: PTDF Auditorium & LT 1

Pre-requisites: Nil **Status**: Compulsory

Instructor (s): Dr. Bori Ige & Dr. R. A. Adesiji

Course Overview and Description

Fundamentals of fluid mechanics course exposes the second-year engineering students to the basic properties of fluids. It also introduces students to hydrostatic forces being experienced by static or stored fluids. Both knowledge of fluid kinematics and fluid dynamics especially continuity equation and Bernoulli equation are as well examined.

Outlines of the Course

Fluid Properties: Density, specific weight, specific gravity, viscosity, surface tension, compressibility, capillarity.

Fluid Statics: Hydrostatic pressure, hydrostatic forces on submerged surface/plane, buoyancy, stability of unconstrained bodies.

Fluid Kinematics: Various classifications such as; steady vs unsteady flows, uniform vs non-uniform flows, laminar vs turbulent flows, inviscid vs viscous flows, rotational vs irrotational flows.

Fluid dynamics: Mass and volumetric flow rates, continuity and Bernoulli equations.

Recommended Texts

1. “Fluid Mechanics” by F. M. White (MCGraw-Hill)

2. “Elementary Fluid Mechanics” by R. L. Street, G. Z. Watters & J. K. Vennard (John Wiley & Sons)

3. “Fundamental of Fluid Mechanics” by B. R. Munson, D. F. Young & T. H. Okiishi (John Wiley & Sons)

Course Learning Outcomes

	Course Learning Outcomes: Upon successful completion of the course, students will be able to:	POs	Bloom Taxonomy level	Assessment Tools
1.	Explain the properties of fluids	1, 2	2	Assignment, Exams
2.	Determine forces in static fluids	1, 2	3	Quizzes, Test, Exams
3.	Determine whether a floating body will be stable	1, 2	3	Assignment, Exams
4.	Classify fluid flows	1, 2	2	Quizzes, Exams
5.	Perform calculations based on principles of conservation of mass: applying continuity equation	1, 2	3	Test, Exams

Grading Standard

Assignments & Quizzes: 20%

Tests: 20%

Examination: 60%

Course Code: MEE 310 (2 Units; Core; L = 30) C**ourse Title:** Engineering Math II,

Contact Hour: Hours per week **Pre-requisite:** Engineering Math I

Contact Time/Venue: Wednesday, 8- 11am, CODEL Building

Semester: First

Lecturers in-charge: Engr. Dr. Alkali Babawuya & O.M. Oyebamiji

Course Overview

Linear Algebra and Analytic Geometry (MATH 301) is a foundational course that covers the essential principles and methods of linear algebra, analytic geometry, and numerical analysis. Students will explore the concepts of matrices, determinants, linear equations, eigenvalues, and eigenvectors, as well as coordinate transformations, solid geometry, and functions of several variables. The course also introduces numerical differentiation, ordinary differential equations, curve fitting, and simple linear programming, with applications to Mechanical Engineering case studies.

Course Contents

Linear Algebra – Elements of matrices, determinants, inverse of matrix. Theory of linear equations, eigen-values and eigen-vectors. Analytic geometry – co-ordinate transformation – solid geometry, polar, cylindrical and spherical co-ordinates. Elements of functions of several variables. Numerical differentiation, solution of ordinary differential equations. Curve fitting. Simple linear programming. Solving problems using Mechanical Engineering case studies

Recommended Texts

1. Linear Algebra and Its Applications by Gilbert Strang (Wiley)
2. Linear Algebra: A Modern Introduction by David Poole (Cengage Learning)
3. Analytic Geometry by George B. Thomas Jr. and Maurice D. Weir (Addison-Wesley)
4. Numerical Analysis by Richard L. Burden and J. Douglas Faires (Cengage Learning)
5. Mechanical Engineering: A Very Short Introduction by David W. Hutton (Oxford University Press)

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Understand and apply matrix operations, determinants, and inverse matrices.	1,2	3	Test, Exams
CLO2	Solve systems of linear equations and find eigenvalues and eigenvectors	2,3	4	Test, Exams
CLO3	Perform coordinate transformations and understand solid geometry, polar, cylindrical, and spherical coordinates.	1,2,3	3	Test, Exams
CLO4	Analyze functions of several variables and understand numerical differentiation	2,4,7	4	Assignment, Project, Exams
CLO5	Solve ordinary differential equations and apply curve fitting techniques.	1,2	4	Assignment, Exams
CLO6	Apply mathematical concepts to Mechanical Engineering case studies.	2,3	5	Assignment, Quiz, Exams

Grading Standard

- Assignments: 10%
- Project: 5%
- Quiz: 5%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE 311 (2 Units; Core; L = 30) C**ourse Title:** Theory of Machines I

Contact Unit(s)our: 2 Hours per week **Pre-requisite:** EET 212

Contact Venue: Thursday, 2-4pm, Rm213 **Semester:** First

Lecturer in-charge: Engr. Dr. A. A. Abdullahi

Course Overview:

Theory of machines I deals with deals with the study of relative motion between the various parts of machine. This course introduces undergraduate students of Mechanical Engineering to the fundamentals of mechanisms & kinematics of machine parts. Analysis and Synthesis of four bar and slider-crank mechanisms. It also provides an in-depth analysis of Transverse vibrations of beam & whirling of Shaft as well as engineering applications of friction.

Outline of the Course:

Introduction to mechanisms; General solutions to velocity and acceleration of simple mechanisms-four bar and slider-crank mechanisms; Transverse vibrations of beams and whirling of shafts; Flywheels, governors, gyroscopes, cams and their applications; Application of friction to wedges, screws, clutches and belt drives.

Recommended Textbooks:

Ashok, G. A. (2007). *Mechanism and Machine Theory*. Ambekar, New Dehli, India.

Brar, J. S, & Bansal, R. K. (2004). *A Textbook of Theory of Machines*. Firewall Media, New Dehli, India.

Khurmi, R., & Gupta, J. (2005). *A Textbook of Machine Design*. 14th Edition. Eurasia, New Dehli, India.

Myszka, D. H. (2004). *Machines and mechanisms: Applied Kinematic Analysis.* 4th Edition, Prentice Hall.

Rattan, S. S. (2014). *Theory of machines.* 3rd Edition, Tata McGraw-Hill Education, New Dehli, India.

Uicker, J. J., Pennock, G. R., & Shigley, J. E. (2011). *Theory of machines and mechanisms* Oxford University Press New York, USA.

Course Learning Outcomes:

CLO	**Course Learning Outcome**: Upon successful completion of the course, student will be able to:	POs	Bloom's Taxonomy Level	Assessment Tools
1.	Understand the mechanics of rigid, fixed, deformable bodies; Understand the concept of Kinematic link and pair; simple and compound mechanisms.	1	2	Quiz, Homework, Test, Exams.
2.	Analyse machine, mechanism(s) and structure. Evaluate the nature of chain as Kinematic (constraint) unconstraint chain or structure (locked chain).	2	4,5	Quiz, Test, Exams.
3.	Analyse degree of freedom or movability of a plane mechanisms; Apply Kutzbach's and Grubler's Criterion to plane Mechanisms. Numeric Examples with class work.	2	3,4	Quiz, Homework, Test, Exams.
4.	Analyse Four bar and slider mechanisms, applying Freudenstein's equation in analytical analysis of the displacement, velocity and acceleration of a simple mechanism (Four bar & slider crank mechanisms).	2,3	3,4	Quiz, Homework, Exams.
5.	Understand the concept of synthesis of mechanisms, and synthesis of problems covering simple mechanism.	1,3	2,6	Quiz, Homework, Exams.
6.	Understand the concept of Machine vibrations. Remember the standard design formulas related to Transverse vibration of beam and Whirling of Shafts. Evaluate natural frequency of free transverse vibrations of shaft subjected to number of point load using Energy (Rayleigh's) method and Dunkerley's method.	1,2	2,3,5	Homework, Exams.
7.	Carryout design and analysis of Machine parts (Governors, Flywheels, Cam & followers and Gyroscopes).	1,3	3,6	Homework, Exams.
8.	Carryout analysis of friction and its engineering Applications of Friction: Belt drives, Wedges and Screw Jack.	1,2	3,5	Homework, Exams.

Grading Standard:

Homework and Quizzes: 20%

Mid-Semester Examination (Test): 20%

Semester Examination (Exams): 60%

Course Code: MEE 313 (1 Units; Core; L = 15) **Course Title:** Engineer-in-Society

Contact Hour: 1 hour per week **Pre-requisite:** Nil

Contact Time/Venue: Mon, 4 - 5pm, R107 **Semester:** First

Lecturers in-charge: Engr. J. Y. Jiya

Course Overview

The course is designed to provide mechanical engineering students with a comprehensive understanding of the intricate relationship between engineering and societal development. The course will explore the historical development of modern society, examining how technological advances in materials, manufacturing, power and fuels, transportation, and communication have shaped contemporary life. Students will critically assess the social and moral implications of these technological advancements and consider their impact on public health, safety, and the environment. The course will also focus on the unique challenges and opportunities for engineering in the Nigerian context, discussing strategic targets for national development. Additionally, the role of professional bodies and engineering societies in upholding professional discipline, ethics, and standards will be thoroughly examined. By the end of the course, students will be equipped to apply ethical principles and professional standards in their engineering practice, making informed decisions that consider societal, cultural, and environmental factors.

Course Contents

Historical development of modern society; Impact of technological advances: Materials and manufacture, power and fuels, transportation and communication, etc., social, moral; Targets and strategies for developing Nigeria; Professional bodies and engineering societies; Maintaining professional discipline, ethics, and standards by engineering societies.

Recommended Texts

1. Engineering Ethics: Concepts and Cases by Charles E. Harris Jr., Michael S. Pritchard, and Michael J. Rabins
2. Technology and Society: Building Our Sociotechnical Future by Deborah G. Johnson and Jameson M. Wetmore
3. The Ethical Engineer: Contemporary Concepts and Cases by Robert McGinn
4. Engineering and Society: Working Towards Social Justice, Part III by Caroline Baillie, Alice Pawley, and Donna Riley
5. Sustainable Engineering: Concepts, Design and Case Studies by David T. Allen and David R. Shonnard

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Analyze historical development and technological advancements	1,2,3,4,6	2	Test, Exams
CLO2	Evaluate technological impacts on society	1,2,3,6	4	Test, Exams
CLO3	Assess social and moral issues.	6	4	Test, Exams
CLO4	Discuss strategies for Nigeria's development	6	3	Test, Exams
CLO5	Describe roles of professional bodies and societies	6,9	2	Exams
CLO6	Apply ethical principles and standards.	6,8,9	3	Assignment, Exams

Grading Standard

- Assignments: 10%
- Test: 30%
- Semester Examination: 60%

Course Code: MEE 314 (2 Units; Core; L = 30) C**ourse Title:** Fluid Mechanics II,

Contact Hour: 2 Hours per week **Pre-requisite:** Fluid Mechanics I

Contact Time/Venue: Mon, 2 - 4pm, CODEL Building **Semester:** First

Lecturer in-charge: Engr. Prof. A. Nasir & Engr. M. Oyebamiji

Course Overview

This course is essential for students pursuing careers in mechanical, civil, or aerospace engineering, providing a solid foundation in the principles and applications of fluid mechanics. The course provides a comprehensive understanding of fluid mechanics, covering the fundamental principles and applications in fluid dynamics, kinematics and hydro-dynamics. Students will learn about fluid properties, fluid statics, fluid dynamics, and flow in pipes and open channels. The course emphasizes problem-solving and practical applications in various engineering fields related to fluid flow.

Course Contents

Review of properties of fluids and Hydrodynamics; Kinematics and dynamics of fluid flow; Conservation principles and equations; Equation of motion neglecting viscosity (Euler's equation in Cartesian tensor notation, also in cylindrical and spherical coordinate systems); Equation of motion for a viscous flow (derive Navier-Stokes equation of motion, the Cartesian tensor forms); Application to laminar and turbulent flow in bounded systems: Laminar flow between parallel plates, flow between concentric cylinders, laminar flow in circular cross-section pipes, turbulent flow in circular cross-section pipes, determination of head loss and use of Moody chart; Separation losses: Sudden expansion and contractions, pipe fittings, bends, pipe entry, equivalent length for pipe fitting loss calculations; Incompressible flow in pipes and duct systems: Incompressible flow through pipes in series, through pipes in parallel, through branching pipes, through pipe networks, resistance coefficients. Power transmission by pipelines; Introduction to unsteady flow in closed pipeline systems; Elements of potential flow: Ideal fluid flow; Simple motion of a fluid element: Translation, rotation and shear deformation; Definition of irrotational motion; Velocity potential; Stream function; Velocity potential; Circulation and vorticity; Vectorial approach; Application of Euler's equation to irrotational flows; 2-D Incompressible potential flow; Flow nets and methods of solution of Laplace equation for stream unction and velocity potential; Energy variation across curved streamlines; Curvilinear flow of an inviscid fluid; Flow patterns & their combinations;

Superposition

Recommended Texts

1. Douglas J. F., Gasoriek J. M., Swaffield J., Jack L. Fluid Mechanics. 5th ed., Pearson PH, 2005. ISBN 0131292935
2. Bruce R. Munson, Theodore H. Okiishi, Wade W. Huebsch & Alric P. Rothmayer. Fundamentals of Fluid Mechanics. John Wiley & Sons, Inc. 2013
3. Gregory Falkovich, Weizm. Fluid Mechanics. 2nd Ed. Cambridge University Press. 2018

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Outcomes (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Describe the properties of fluids in motion and in stationary position.	1,2	2	Test, Exams
CLO2	Apply the equations of fluid flows in Cartesian, cylindrical coordinate systems to practical flows systems.	1,2	3	Test, Exams
CLO3	Derive and apply Navier-stokes equations to laminar and turbulent flows in bounded systems	2,4	3	Test, Exams
CLO4	Evaluate Head Loss in fluid flows using Moody Chart for different flow regimes	2,4,11	5	Test, Exams
CLO5	Analyze incompressible flows through pipes in series, parallel and branching pipes.	1,2	4	Test, Exams
CLO6	Define Irrotational flows, velocity potential, vorticity, circulation and stream function in hydrodynamics for ideal systems.	1	1	Assignment, Project, Exams
CLO7	Analyze flownet and methods of solution of laplace equation for stream function and velocity potential in ideal flow system.	2,3	4	Assignment, Quiz, Exams
CLO8	Analyze energy variation across curved streamlines and superposition of flows.	2,3	4	Assignment, Quiz, Exams

Grading Standard

- Assignments: 10%
- Project: 5%
- Quiz: 5%
- Test: 20%
- Semester Examination: 60%

Course Title: Workshop Practice.
Course Code: MEE 315 (2 Units, L = 28)

Contact Hour: 2 hours

Contact Venue: Monday, 10:00 - 12:00 pm, Room 213, First semester

Lecturer in – charge: Engr. Dr. M. M. Muhammadu and Engr. Prof. N. A. Musa

Course Overview:

Workshop practice provide the students opportunities and exposes to various types of workshop equipment, machines and materials use in standard workshop, how instruments and tools be use, how machine operate in workshop, distinguish safety procedures in workshops. Describe and enumerate different engines parts, functions, defeats, what are step taking in engine servicing (petrol Engines). Doing this course of workshop practice would enable a graduate of the programme to have the opportunities and necessary skill to contribute towards the attainment of goals 1, 2, 4 and 10 (Agenda 2063) and goals 4, 8 and 11 (SDG 2030). These are some of the areas that can improve quality of education, standard of living, transformation of economics, world-class manufacturing and self-empowerment. The objectives of the course, learning outcomes, and contents are made to address this need.

Course contents

Workshop setting: types of workshop equipment, machines and materials, use of instruments and tools, machine operation practice, Safety procedures in workshops.

Main engines parts – functions, defeats, Engine servicing (petrol Engines)

Recommended Texts

Automotive Technology: A systems approach, 7th Edition, Jack Erjarec and Rob Thompson.

Automotive Technology: A systems approach, 7th Edition, Ubuy.

Automobile Engine: Theory and serving by Helderman.

Automobile Mechanical and Electrical systems, 2nd Edition by Ubuy.

Automotive product development – A systems engineering Implementation by Vivec O. Bhise.

Course Learning Outcomes

	Course Outcome: Upon successful completion of the course, student will be able to	POs	Blooms Taxonomy	Assessment Tools
CO1	Identify and classify various types of workshop equipment, machines and materials use in standard automobile workshop.	1, 3	3	Assignment, exams
CO2	Distinguish different parts or component of an automobile.	2, 3	4	Assignment, exams
CO3	Describe and how instruments and tools be use, how machine operate in workshop.	2, 4	3	Assignment, exams
CO4	Describe and enumerate different engines parts, functions, defeats. Distinguish between spark ignition and compression ignition engines.	2, 4	4	Assignment, exams
CO5	Describe the step taking in engine servicing (petrol Engines).	2, 4	3	Assignment, exams
CO6	distinguish safety procedures in automobile workshops.	1, 3	2	Assignment, exams

Grading Standard

Assignments: 20%

Continuous Assessment: 20%

Semester Examination: 60%

Course Code: MEE 316 (3 Units; Core; L = 45) **Course Title:** Control System

Contact Hour: 3 Hours per week **Pre-requisite:** Nil

Contact Venue: Tuesday, 10 – 1 pm, Codel Building **Semester:** First

Lecturers in-charge: Engr. Prof. O. A. Olugboji

Course Overview

This course provides a comprehensive introduction to control systems, focusing on the design and analysis of systems that regulate dynamic processes. Students will explore fundamental concepts including system modeling, stability analysis, feedback control, and controller design.

Course Contents

Review of Laplace Transformations. Control engineering concepts; Transfer functions; Differential equation of control systems; Transducers; Automatic control methods. Signal flow graphs. Routh Criteria. Block diagrams.

Recommended Texts

1. Ogata, K. **Modern Control Engineering,** 2024.
2. Gene Franklin, J. Da Powell, & Michael Workman. **Feedback Control of Dynamic Systems.** 2023
3. Norman S. Nise . **Control Systems Engineering** 2022.
4. Benjamin C. Kuo and Farid Golnaraghi. **Automatic Control Systems.** 2023.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Introduction to basic concepts, types of systems, and applications	1,2	2	Assignment, Exams
CLO2	Analyze system stability and performance using various methods and design controllers to meet specific performance criteria	2,3	4	Assignment, Exams
CLO3	Apply mathematical tools to model and analyze the dynamics of physical systems.	1,2,3	5	Assignment, Exams
CLO4	Evaluate system performance in the time domain using step response, impulse response, and transient analysis	2,4	3	Assignment, Exams
CLO5	Describe how feedback mechanisms work in control systems and their impact on system performance.	1,2	2	Assignment, Exams

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO6	Understand and design digital control systems, including discrete-time controllers and sampling theory.	2,4	5	Assignment, Project, Exams
CLO7	Analyze and design controllers for nonlinear systems and understand common challenges associated with them	1,2	2	Project, Exams
CLO8	Implement control strategies in both continuous and digital domains.	2,3	4	Assignment, Exams

Grading Standard

- Assignments: 10 %
- Project: 10 %
- Continuous Assessment: 20 %
- Semester Examination: 60 %

Course: MEE 317 **Course Title:** Laboratory Practical III

Course Unit (s): Three (3) **Time:** 3 Hours Contact Time Per Week

Semester: FIRST **Location:** Mechanical Workshop, Strength of material Lab. and TETFUND Lab.

Pre – requisites: N/A Status: Compulsory

Instructor (s): Engr M.O Oyebamiji, Engr Bello, Engr Kazeem & Engr Liffi

Course Overview and Description

The course is essentially a laboratory work involving laboratory experiments practical designed to familiarize students with various experimental skills. This practical course aims to provide hands-on experience in mechanical engineering fundamentals, focusing on flywheels, belt friction, CNC lathe and CNC milling machines, and automobile maintenance. Students will develop problem-solving skills, critical thinking, and technical expertise through experimentation and real-world applications.

Outlines of Course

A laboratory course work involving laboratory experiments and practical in the following courses: Theory of Machine, Fluid Mechanics, Workshop Practice and Welding & Brazing

RECOMMENDED TEXTS:

Smith, W. F. (2018). Materials Science and Engineering.

Halderman, J. D. (2020): Automotive Technology. Principles, Diagnosis, and Service. Pearson Education.

Rolling, D.C. (2019). Automotive engineering: Principles and application CRC Press. American Society of Mechanical Engineers (ASME

Course Learning Outcomes:

CLO	Learning Outcomes: Upon successful completion of the course students will be able to:	POs	Bloom Taxonomy Level	Assessment Tools
1.	Understand and calculate belt friction and its applications.	1,2	1	Practical and report writing from experiment(s).
2.	Perform various machining operations (turning, facing, drilling, milling).	1,3	2	Practical and report writing from experiment(s). Practical and report writing from experiment(s).

CLO	Learning Outcomes: Upon successful completion of the course students will be able to:	POs	Bloom Taxonomy Level	Assessment Tools
3.	Perform routine automobile maintenance and repairs	5	4	Practical and report writing from experiment(s).
4.	Develop problem-solving skills through hands-on experimentation	2	3	Practical and report writing from experiment(s).
5.	Apply theoretical knowledge to practical problems	1,3	2	Practical and report writing from experiment(s).

GRADING STANDARD:

Practical and report writing from experiment(s). (100%)

Assessment:

- Practical Reports (40%)
- Quizzes and Tests (20%)
- Group Projects (20%)
- Individual Participation and Attendance (20%)

Course Code: MEE 412 (2 Units; Core; L = 30) C**ourse Title:** Thermodynamics III,

Contact Hour: 2 Hours per week **Pre-requisite:** Thermodynamics II

Contact Time/Venue: Mon, 2 - 4pm, R108 **Semester:** First

Lecturers in-charge: Engr. Prof. A. Nasir & Engr. J. Y. Jiya

Course Overview

Thermodynamics III delves into advanced concepts of thermodynamics, focusing on the behaviour and analysis of non-reactive gaseous mixtures, psychrometry, fuels and combustion, internal combustion engines, and heat transfer. This course equips students with essential knowledge for understanding and applying thermodynamic principles in various practical contexts, such as air conditioning and energy systems. By offering this course, graduates will develop skills necessary to contribute to sustainable engineering solutions, enhancing the quality of life and supporting the attainment of goals outlined in Agenda 2063 and the Sustainable Development Goals (SDG 2030).

Course Contents

Thermodynamics of non-reactive gaseous mixtures; Gaseous mixtures, Psychrometry and applications – Air-conditioning, cooling towers, etc; Fuels and combustion: Definitions, fuel and product analysis, chemical balance of reaction, chemical equilibrium, dissociation; Reciprocating internal combustion engines: Working principle, performance, factors limiting performance, comparison of real I.C engine with air-standard cycles; Conduction heat transfer: Fourier's law, steady and unsteady conduction, conduction through composite walls, conduction through thick-walled cylinders, conduction with internal heat generation, thermal conductivities of materials in common use.

Recommended Texts

1. Cengel, Y.A., & Boles, M.A. Thermodynamics: An Engineering Approach. McGraw-Hill, 2019.
2. Moran, M.J., Shapiro, H.N., Boettner, D.D., & Bailey, M.B. **Fundamentals of Engineering Thermodynamics**. Wiley, 2018.
3. Sonntag, R.E., Borgnakke, C., & Van Wylen, G.J. **Fundamentals of Thermodynamics**. Wiley, 2017.
4. Holman, J.P. **Heat Transfer**. McGraw-Hill, 2010.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Outcomes (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Describe the properties and behavior of non-reactive gaseous mixtures and perform calculations related to gas mixtures.	1,2	2	Test, Exams
CLO2	Apply psychrometric chart in the design of air conditioning systems and cooling towers.	2,3	3	Test, Exams
CLO3	Explain the principles of fuels and combustion, including fuel analysis and chemical balance of reactions.	1,2,3	2	Test, Exams
CLO4	Evaluate the working principles and performance factors of reciprocating internal combustion engines and compare them with air-standard cycles	2,4,7	5	Assignment, Project, Exams
CLO5	Apply Fourier's law and analyze conduction heat transfer in various contexts, including composite walls and internal heat generation.	1,2	3	Assignment, Exams
CLO6	Solve complex problems related to steady and unsteady heat conduction and convection in one and two-dimensional situations.	2,3	5	Assignment, Quiz, Exams

Grading Standard

- Assignments: 10%
- Project: 5%
- Quiz: 5%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE 413 (3 Units; Core; L = 45)

C**ourse Title:** Mechanical Engineering Design I

Contact Hour: 3 Hours per week **Pre-requisite:** MEE 328

Contact Time/Venue: Thur. 10am – 1pm, GF116 **Semester:** First

Lecturers in-charge: Engr. Dr. I. C. Ugwuoke and Engr. Dr. O. Adedipe

Course Overview

Mechanical Engineering Design I is a course that deals with the principles and application of subjects such as engineering mechanics, mathematics, strength of materials, theory of machines and engineering drawing for the creation of cost-effective new products, machines and improvement of existing ones. Mechanical Engineering Design I course provides useful information to final year students on design concepts, design methods and modelling techniques technologies that are needed to solve specific design engineering challenges.

Course Contents

Analytical approach to design; Overview of the steps in engineering design process and introduction to analytical/qualitative techniques applicable to each step; Recognition of need, specification formulation, concept generation; Concept selection, embodiment and detail design; Optimization, geometric representation for visualization and manufacture and product lifecycle.

Recommended Texts

1. Khurmi, R.S., & Gupta, J.K., A Textbook of Machine Design, Eurasia Publishing House (Pvt.) Ltd. Ram Nagar, New Delhi-110 055, 2005.
2. Joseph, E. Shigley, & Charles, R. Mischke, Mechanical Engineering Design (in SI Units) Sixth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
3. Joseph, E. Shigley, & Charles, R. Mischke, Standard Handbook of Machine Design, Second Edition, McGraw-Hill Publishing Company Limited, New York, 1996.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Describe the design concepts for product development and modification of existing designs into new ideas	1,2	2	Test, Exams

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO2	Understand the fundamental principles of mechanics for the creation of engineering components and products.	2,3	4	Test, Exams
CLO3	Understand the application of iterative design processes such as planning, modelling, prototyping, building and testing	1,2,3	5	Test, Exams
CLO4	Explain the importance of product design limitations such as cost, time and material availability	2,4	3	Test, Exams
CLO5	Explain the Empirical and mathematical formulae that are relevant to design and analysis of machine components	1,2	2	Test, Exams
CLO6	Understand the use of optimization techniques to obtain the best design for a specific function through analysis of forces, design of elements and material selection	2,4	5	Assignment, Test, Exams
CLO7	Describe the principles of optimum design of machine components for given objective functions and design constraints.	1,2	2	Test, Exams
CLO8	Analyze the types of operational loads and stresses that are experienced by specific product or component	2,3	4	Test, Exams
CLO9	Apply engineering design framework coupled with the manufacturing techniques for the production of engineering components	2,4,11	5	Project, Exams
CLO10	Understand the selection of suitable material(s) to aid the manufacturing process of engineering components	1,3	3	Assignment, Exams
CLO11	Explain the relationship of material selection, properties and functional requirements of the final products	2,3,4	4	Assignment, Exams
CLO12	Explain how to solve complex design problems using the principles of mathematical modelling	2,3	4	Assignment, Exams
CLO13	Apply computer aided design software for detailed engineering drawing coupled with modification and design of machine components	1,5	3	Assignment, Exams

Grading Standard

- Assignments: 10%
- Project: 10%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE 414 (2 Units; Core; L = 30)

C**ourse Title:** Fluid Mechanics III

Contact Hour: 2 Hours per week

Pre-requisite: MEE 314 Fluid Mechanics II

Contact Time/Venue: Tuesday, 2 – 4 pm/LR 203

Semester: First

Lecturer in-charge: Engr. Dr. S. A. Ayo

Course Overview

Fluid Mechanics III encompasses the principles of developing general relationship connecting variables governing a fluid flow problem, and how to use such expressions to design scaled sizes of a real system to simplify experiment design and analysis of the resulting data. The principles include the methods of developing the relationships and the conditions to ensure the similarity of scaled and real systems. The methods of application of the principles to internal flows such as in a pipe and external flows as around ships, screw propellers and ventilation fans are covered. The course also includes the principles by which fluid-immersed bodies in motion experience drag forces as a result of the boundary layer that is developed within the thin layer of fluid surrounding the body and the methods of analysing and evaluating the drag forces. These include description of the concept of boundary layer, factors affecting the characteristics of the layer, and analysis to yield the important parameters for evaluating the drag forces. It also covers demonstration of the application of the principles to flows around systems such as flat plates, ships and through wind tunnels. The principles of development of drag and lift forces due to the combined effect of boundary layer and pressure differential around a body are also covered in the course. These include how pressure differential along the horizontal and vertical axes of a body gives rise to total drag and lift forces, respectively, the principles of pressure recovery and flow separation. The application of the principles to calculating drag and lift forces for bodies such as cylinders, spheres and aerofoils is also covered. An effective administration of the contents of the course to our students should equip them to be able to design, analyse and solve problems relating to pipe flow, aerodynamics of aerofoils and vehicles and building aerodynamics. This therefore has the potential to lead to our country's self-reliance in the design and operation of these and other similar systems and, thus, address the UN SDG 2030 goals 7 and 8, and contribute to putting the country on the

path of sustainable development.

Course Content

Dimensional analysis and similitude. Quantities, their dimension and units. Methods of relating quantities. Rayleigh or indicial method, group method etc. Dimensionless numbers. Buckingham's theorem. Applications of dimensional analysis. Geometric, kinematics and dynamic similarity applications. Boundary layer flow; concept and description of boundary layer. Definitions: Boundary layer thickness, displacement thickness, momentum thickness; Velocity profile and shear stresses in the boundary layer. von-Karman momentum integral equation of the boundary layer, Laminar boundary layer on a smooth flat plate with zero gradient. Lift and drag on a body. Incompressible flow around a body flow past a cylinder, a sphere, aerofoils etc.

Recommended Texts

1. Fluid Mechanics by John F. Douglas, Janusz M. Gasiorek, John. A. Swaffield, and Lynne B. Jack
2. Basic Equations of Engineering Science Schaum's Outline Series
3. Viscous Fluid Dynamics by J. L. Bansal
4. Fluid Mechanics by Pijush K. Kundu, and Ira M. Cohen
5. Applied Fluid Mechanics by Robert L. Mott and Joseph A. Untener, 7th Edition
6. Fluid Mechanics by Frank M. White (McGraw-Hill)
7. Fluid Mechanics: Fundamentals and Applications by Cengel and Cimbala (McGraw-Hill)

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Explain the principles of dimensional analysis & similitude, stating the uses of dimensional analysis and fundamental dimensions of various flow variables (PO1)	1	2	Test, Exam
CLO2	Describe Rayleigh and group methods of dimensional analysis (PO1 & PO2) and demonstrating the applications to solve internal and external flows problems such as in pipe flows, and flow around ships, screw propellers and fans (PO4)	1, 2, 4	4	Test, Exam
CLO3	Describe the procedures for carrying out similarity analysis between models and prototypes (PO1 & PO2) and applying the procedures to solve problems for various systems (PO4)	1, 2, 4	3	Test, Exam

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO4	Describe the concept and development of boundary layer flow for external and internal flows, stating the various factors that are involved (PO1)	1	2	Assignment, Project, Exam
CLO5	Carry out the analysis of laminar boundary layer for flow over a flat plate (PO2), developing relevant equations (PO3) and applying them to solve problems of skin friction drag (PO4)	2,3,4	4	Assignment, Test, Exam
CLO6	Explain pressure drag and various concepts such as flow separation and reversal (PO1), development of total drag and lift around an immersed body (PO2) and the application of the principles to solve problems of total drag and lift associated with the bodies (PO4)	1,2,4	4	Assignment, Quiz, Exam

Grading Standard

- Assignments: 10%
- Project: 5%
- Quiz: 5%
- Test: 20%
- Semester Examination: 60%

Course Title: Automobile Technology and design workshop.

Course Code: MEE 431 (2 Units, L = 28)

Contact Hour: 2 hours

Contact Venue: Wednesday, 11:00 - 1:00 pm, Room 213, First semester

Lecturer in – charge: Engr. Dr. Muhammadu Masin Muhammadu

Course Overview:

Automobile technology and design workshop provide the students opportunities and exposes them to different types and classifications of automobiles. Several kinds of transmissions can be employed in a vehicle, Types of steering systems, Types of suspension systems. The automobile segment comprises the following four broad categories of vehicles, Benefits of Two-wheelers, Identification of Two-wheelers. Passenger Vehicles and Commercial Vehicles, Agricultural Vehicles, Construction Equipment Vehicles, Special Vehicles. The auto components such as chassis and auto body chassis, engine and its components, lubrication system, fuel supply system, transmissiom system, tront and rear axles, steering and suspension. Doing this course in Automobile technology and design workshop would enable a graduate of the programme to have the opportunities and necessary skill to contribute towards the attainment of goals 1, 3, 4 and 10 (Agenda 2063) and goals 4, 8 and 11 (SDG 2030). These are some of the areas that can provide quality of education, standard of living, transformation of economics and world-class infrastructure. The objectives of the course, learning outcomes, and contents are made to address this need.

Course contents

Introduction to automobiles, types and classifications.

Various systems of an automobile, main parts/components, description, functions, and

Operations: fuel, ignition and braking systems.

Recommended Texts

Automotive Technology: A systems approach, 7th Edition, Jack Erjarec and Rob Thompson.

Automotive Technology: A systems approach, 7th Edition, Ubuy.

Automobile Engine: Theory and serving by Helderman.

Automobile Mechanical and Electrical systems, 2nd Edition by Ubuy.

Automotive product development – A systems engineering Implementation by Vivec O. Bhise.

Course Learning Outcomes

	Course Outcome: Upon successful completion of the course, student will be able to	POs	Blooms Taxonomy	Assessment Tools
CLO1	Identify and classify different types of automobiles.	1, 3	3	Assignment, exams
CLO2	Distinguish different kinds of transmissions that can be employed in a vehicle and classify types of steering systems.	2, 3	4	Assignment, exams
CLO3	Classify types of suspension systems, identify automobile segment, benefits of Two-wheelers and Identification of Two-wheelers,	2, 4	3	Assignment, exams
CLO4	Distinguish Passenger Vehicles and Commercial Vehicles.	2, 4	4	Assignment, exams
CLO5	Differentiate agricultural Vehicles, Construction Equipment Vehicles, Special Vehicles.	1, 3	4	Assignment, exams
CLO6	differentiate different types lubrication system, fuel supply system, transmission system, front and rear axles, steering and suspension	2,4	2	Assignment, exams

Grading Standard

Assignments: 20%

Continuous Assessment: 20%

Semester Examination: 60%

Course Code: MEE 511 (2 Units; Core; L = 30)

Course Title: Metallurgy II

Contact Hour: Two Hours **Pre-requisite:** Material science & Metallurgy I

Contact Venue: Room 108 **Semester:** First

Lecturers in-Charge: Prof. N. A, Ademoh

1.0 Senate-approved relevance

Engineering metallurgy II is one of the core courses of study that is approved by the Senate of Federal University of Technology, Minna as one of the mandatory courses of study to qualify for award of the degree of B. Eng in mechanical engineering. This is in conformity with BMASS/CCMASS stipulated by NUC academic standard.

2.0 Course Overview

The course is taught at 500 level at the first semester. The rapid rate of changes in technology application and knowledge-based competition for developed market share and relevance in offerings of mechanical goods and services in terms of manufactured equipment and machinery with maintenance has placed serious requirement on a very sound knowledge of the selection and use of different metals in mechanical system. This is to enable proper choice of metals and alloys for the most economical for mechanical design to give optimum functional performance that meets with system reliability standards. The course exposes students to theories of metals and alloys, formation processes of alloying metals, the property enhancement of alloying metals, effects of different elements in alloying, applications of alloys, specialized alloys and their uses etc.

3.0 Objectives

Objectives of Metallurgy II as a core course curriculum of mechanical include but not limited to the following:

a. Deepen the knowledge of students on the general properties of pure metals and alloys
b. Illustrate the principles of alloying metals
c. Explain selection process of certain elements for typical alloys and characteristics roles in the alloys.
d. Alloy phase diagrams and the interpretation in respect of mechanical properties of metallic materials.

e. Acquaint students on the classes of ferrous alloys including particularly plain carbon and alloy steels
f. Broaden student's knowledge on choice of metals for specialized applications requiring the use of stainless steel, tool steels, structural steels and other non- ferrous alloys.
g. Expose students to the influence of choice of particular metals by the environment of application.
h. Cost effects of metal choice for mechanical design and construction.
i. Demonstrate the use of metallurgy to safety and reliability design, manufacturing and maintenance of mechanical systems.

4.0 Course Learning Outcomes

The expected outcome of the course of the students after undergoing the course are that they should be able to:

(a) Distinguish the differences between pure metals and alloys
(b) Identify ferrous metals from non- ferrous metals.
(c) Know the different classes of iron in the simplest forms as plain carbon, medium carbon and high carbon iron including cast irons.
(d) Understand the processes of alloy formation.
(e) Know the factors that allow the formation of alloy systems.
(f) Understand and be able to interpret binary alloy phase diagrams.
(g) Know the typical phases present in iron-carbon phase diagrams and their technical implications.
(h) Understand the different classes of stainless steels and the common applications and their preference for certain applications.
(i) Identify and interpret the different phases in alloy equilibrium diagrams and what the phases represent in terms of the physical and mechanical properties.
(j) Illustrate types of solid solutions in binary alloys and show how the solid solution types dictate the properties of alloys.
(k) Know the commercial notations of structural steels by ASME and other standards.
(l) Select metals for corrosion resistance in mechanical design.
(m) Select metals for heat resistant applications.
(n) Acquaint themselves with special alloys like monels and others which are not stainless

steels but were offered before the advent stainless steels which still compete with stainless steels for choice in specialized applications.

(o) Get acquainted with the various methods of heat treatments and the targeted property enhancements.

(p) Know the selection of heat treatment media for optimum property improvements.

(q) Review existing mechanical designs in terms of metals sued to appreciate the costs of constructions and functionability to request for revisions of design based on construction.

(r) Select metals for service applications based on strength, heat treatment, and available forming techniques for economical and affordability of designs.

5.0 Course Content

Definition of alloys, classification of metals alloys, alloy formation processes, significant effects of alloying elements, metal alloy solid solution formation, metal alloy phase diagrams. Steel; classes of carbon steel, iron-carbon phase diagrams, phases in steel, critical temperatures in the iron-carbon phase diagrams, effect of compositions in heat treatment. Effects of alloying elements on steel, classification of steel, common steel and alloying elements. Stainless steels, types of stainless steels, tool steels, heat resisting steels and structural steels. Steels used in building structures shapes of structural steels. Monels, composition, advantages, disadvantages of monels, types and uses. Heat treatment of steels, heat treatment quenching media, TTT-diagram, benefits of alloying elements in the heat treatment of steels.

6.0 Minimum Academic Standards

Before taking metallurgy II the student is expected to have taken materials science at 200 level and engineering metallurgy I at 300 level to facilitate his assimilation level/rate of understanding as the course may be abstract.

7.0 Recommended Textbooks:

(a) Engineering metallurgy (any author available)

(b) Metallurgy for engineers (any author available)

(c) Materials science (any author available)

(d) Online sources (any author available)

(e) Lecture’s Notes

Course Code: MEE 512 (2 Units; Core; L = 30)

C**ourse Title:** Mechanical Vibrations

Contact Hour: 2 Hours per week **Pre-requisite:** Control System

Contact Venue: Mon, 10 – 12 pm, R108 **Semester:** First

Lecturers in-Charge: Engr. Prof. O. A. Olugboji

Course Overview

This course offers a comprehensive introduction to the principles and applications of mechanical vibrations. It is designed to provide students with a solid foundation in the analysis, modeling, and control of vibratory systems. Emphasis is placed on understanding the physical phenomena of vibrations, mathematical modeling, analytical techniques, and practical applications in engineering.

Course Contents

Review of Lagrange Equations. Free and forced vibrations of lumped mass-spring systems with harmonic, periodic and non-periodic excitations; Matrix methods and eigenvalue problems; Natural frequencies and modes of vibrations and resonance. Free and forced damped vibrations

Recommended Texts

1. Singiresu S. Rao. **Mechanical Vibrations,** 6th edition 2017.
2. Mahesh Chandra Luintel. **Textbook of Mechanical Vibrations**, 2023.
3. Balakumar Balachandran & Edward B. Magrab. **Vibrations" (3rd Edition)** 2018.
4. Tony L. Schmitz & K. Scott Smith. **Modeling and Measurement**. 2021

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Describe the fundamental concepts of mechanical vibrations.	1,2	3	Assignment, Exams
CLO2	Analyze the effects of different types of damping on system behavior	2,3	4	Assignment, Exams
CLO3	Understand and analyze the response of systems to harmonic and non-harmonic excitation forces.	1,2,3	3	Assignment, Exams
CLO4	Develop mathematical models of mechanical systems subject to vibrational forces	2,4,7	4	Assignment, Exams

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO5	Understand and interpret the behavior and analysis of nonlinear vibratory systems.	1,2	4	Assignment, Exams
CLO6	Apply vibration principles in the design and analysis of mechanical systems and structures.	2,3	5	Assignment, Quiz, Exams
CLO7	Develop the ability to model and analyze single and multi-degree-of-freedom vibratory systems.	2,4,11	5	Project, Exams
CLO8	Evaluate the various methods for solving vibration problems	1,3	3	Assignment, Exams
CLO9	Apply vibration analysis techniques to real-world engineering problems	2,3,4	4	Assignment, Exams
CLO10	Familiarity with modern tools and software used in vibration analysis.	2,3	4	Assignment, Exams
CLO11	Develop problem-solving skills for practical vibration issues encountered in engineering practice.	1,5	3	Assignment, Projects

Grading Standard

- Assignments/Projects: 20 %
- Continuous Assessment: 20 %
- Semester Examination: 60 %

Course Code: MEE 515 (2 Units; Core; L = 30)

C**ourse Title:** Engineering Management and Law

Contact Hour: 2 Hours per week **Pre-requisite:** Nil

Contact Time/Venue: Friday 8 – 9am, LT 1 **Semester:** First

Lecturers in-charge: Engr. Dr.Sadiq S.Lawal and Bar. Shaibu Okeji Esq

Course Overview

Management and leading styles that utilises effectively available human and natural resources, timely and profitably as the case of the core aim and objectives of the establishment may be by adequately putting place a mechanism for organising, staffing, controlling, coordinating, motivating and directing the organization to get the job done and done optimally and satisfactorily. The various management levels and hierarchy of the various personnel are clearly outlined with the functions and line structures of the organization. Conflict resolutions and interests are to be skillfully managed to keep the organization running. Utilising SWOT Analysis as a strategic Planning tools to manage effectively. Cost Control in term of direct and indirect materials and labour, factory cost, overhead fixed and working Capital, long term and short-term capital are put into perspective. Total Quality management and maintenance management of all the equipment are optimized for best results Nigeria Legal System as it affects engineering, Industrial safety laws and labour relations, law of contracts and Agency law are studied.

Course Contents

Management Functions: (organizing, staffing, controlling, coordinating, directing). Organization charts and organizational levels. Organization structures: (line, line and staff, functional, matrix, informal). Use of committees, organizational planning (short-term, intermediate-term and long-term). Personnel management: Role of people in an organization. Functions of personnel department (employment, training, health, safety, benefits, incentive schemes, services etc). Financial management: Kind of capital (equity and borrowed capital, long-term and short-term capital, fixed and working capital). Cost control: Basic cost elements (direct labor cost, direct material cost, overhead, factory cost) Quality Management: Product life cycle, quality assurance, quality control techniques, Organizing for quality, Economics of quality (appraisal, failure and prevention costs). Product liability: Production Cost Control and Break-even Analysis Total Quality Management (TQM), Maintenance Management: Scope of maintenance, organizing for

maintenance; Types of maintenance (corrective, preventive, predictive).

Nigeria Legal System as it affects engineering: Industrial safety laws; Industrial law and labour relations, law of contracts and torts; Agency law. Principles and types of business ownership, including advantages and disadvantages of each; steps in setting up a partnership.

Recommended Texts

1. Martand Telsang, Industrial Engineering and Production Management, S.Chand and Company Ltd,2006
2. Celestine C. Nwachukwu, Management Theory and Practice, Revised Edition,2006

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	**Description**	**Program Objectives (POs)**	**Bloom's Taxonomy Level**	**Assessment Tools**
CLO1	Understand the Concepts and theory of effective Management of an Organization.	1,2	2	Test, Exams
CLO2	Analyze the principles, roles and objectives of the organizational Goals and set up	2,3	4	Test, Exams
CLO3	Evaluate the Functions of the various organizational level and line/chain of command amongst the three levels of management namely Top, Middle, and first line Management.	1,2,3	5	Test, Exams
CLO4	Apply understanding of the organizational processes to appreciate retrogressively their just concluded place of industrial attachment as well as coming up with the management structure and organogram of the University	2,4	3	Assignment, Exams
CLO5	Explain the fundamentals of Key Principles of Delegation, Conflict of Interest and use of Committee to manage emerging management situations	1,2	2	Test, Exams
CLO6	Design and analyze the performance of their Strengths, Weakness, Opportunities and Threats (SWOT Analysis) to navigate the intricacies of effective and successful management.	2,4	5	Quiz/Project Exams
CLO7	Understand the operation of Cost Control and Break-even Analysis as basic cost elements (direct labor cost, direct material cost, overhead, factory cost) Quality Management: Product life cycle, quality assurance, quality control techniques, Organizing for quality, Economics of quality (appraisal, failure and prevention costs).	1,2	2	Test, Exams
CLO8	Apply the practical understanding of knowing the Strengths, Weaknesses, Opportunities and Threats (SWOT Analysis) as strategic planning tool in	2,3	4	Quiz, Exams

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
	business and other life endeavors as demonstrated in the Class			
CLO9	Discuss the Total Quality Management (TQM) and Maintenance Management of the organization and analyze the relationship between the various types of maintenance (corrective, preventive, predictive)	2,3,4	4	Test, Exams
CLO10	Understand the parameters that inform choice of the most effective, efficient and sustainable mode of maintenance	1.2	2	Test, Exams
CLO11	Understanding the Nigeria Legal System as it affects engineering Industrial safety laws; Industrial law and labour relations, law of contracts and Agency law.	1,2	2	Test, Exams
CLO12	Utilize methods and Principles and types of business ownership including advantages and disadvantages of each to setting up of a partnership.	1,5	3	Test, Exams

Grading Standard

- Assignments: 10%
- Project/Qiuz: 10%
- Test: 20%
- Semester Examination: 60%

Course: MEE 517 **Course Title:** Laboratory Practical IV

Course Unit (s): Three (3) **Time:** 3 Hours Contact Time Per Week

Semester: FIRST **Location:** Mechanical Engineering Lab.

Pre – requisites: N/A Status: Compulsory

Instructor (s): Engr. Dr. A.B. Garba, Engr. A. Lifi, Engr, Aliyu & Engr. Prof. N.A Musa

Course Overview and Description

The course is essentially a laboratory practical work involving laboratory practical and experiments in order to familiarizes students with various skills knowledge involved in the practical works. This includes but not limited to; various operations in Lathe machining, Arc welding of parent metals, Automobile maintenance and checking component part using Digital multimeter. The course is aimed at impacting skills knowledge for students' growth and productiveness.

Outlines of Course

A laboratory course work which involves laboratory practical skills works in the following courses; Lathe machining operations, Arc welding of metals, Automobile service and Overhaul of engine and Digital multimeter equipment usage.

RECOMMENDED TEXTS:

Gilles, T (2014) Automotive Engines- Diagonosis, Repair and Rebuilding, 7th Edition, Cengage Learning publishers London

ANAMMCO (2007) Basic Engine Principle, Module 2.

ANAMMCO (2007) Fuel Injection system, Module 9.

Elliot, K.G (2022) The Practical Book of Welding: Tips and method of welding, for beginners & expert guide. Independent publisher.

Gupta, H.N., Gupta, R.C and Mittal, A (2009). Manufacturing Processes. 2nd Edition, New Age International (P) Limited, New Delhi.

Course Learning Outcomes:

CLO	Learning Outcomes: Upon successful completion of the course students will be able to:	POs	Bloom Taxonomy Level	Assessment Tools
1.	Have a good knowledge of vehicle maintenance, servicing and Overhauling of an engine. Arc welding works and Lathe machining operations.	1	1	Practical and report writing from Practical performed

CLO	Learning Outcomes: Upon successful completion of the course students will be able to:	POs	Bloom Taxonomy Level	Assessment Tools
2.	Understand the Principles of step by step in service and Overhauling of an engine, Arc welding principle and steps in carrying out Lathe machining operations	1,3	2	Practical and report writing from Practical Practical and report writing from Practical
3.	Classify the differences between service and overhauling of an engine, different types of welding joints and various operations in Lathe machining work.	5	4	Practical and report writing from Practical
4.	Knowledge on the functionality of Digital multimeter equipment and various parts of vehicles components	2	3	Practical and report writing from Practical
5.	Understand the basic concept of welding practice, automobile maintenance and operations in Lathe machining	1,3	2	Practical and report writing from Practical

GRADING STANDARD:

Practical and report writing from experiment(s). (100%)

Course Code: MEE 518 (2 Units; Core; L = 30)

Course Title: Engineering Material Selection and Economics

Semester: First

Pre-requisite: Nil

Contact Time/Venue: Fri, 8 – 11am, R213

Contact Hour: 2 Hours per week

Lecturers in-charge: Engr. Dr. O. Adedipe & Engr. J. Y. Jiya

Course Overview

This course provides an in-depth understanding of the principles and methodologies for selecting engineering materials based on their functional characteristics, specifications, and economic considerations. It covers material classification, grouping, standards, and the concept of strength-to-weight ratio. Applications to various materials such as steel, cast iron, non-ferrous materials, plastics, and ceramics are included. Additionally, the course emphasizes materials economics, optimized selection, substitution criteria, and the formalization of the selection process.

Course Contents

Material classifications. Grouping, sub-grouping, Functional characteristics; Specifications and standards; concepts of selection of engineering materials. Materials economics, optimized selection and substitution criteria. Concept of strength-to-weight ratio. Applications to steel, cast iron, non-ferrous materials etc. Formalization of the selection process. Engineering plastics, ceramics and wooden products

Recommended Texts

1. Materials Science and Engineering: An Introduction by William D. Callister Jr. and David G. Rethwisch
2. Engineering Materials 1: An Introduction to Properties, Testing, and Design by David R.H. Jones and Michael F. Ashby
3. Materials Selection in Mechanical Design by Michael F. Ashby
4. Mechanical Engineering Design by J.E. Shigley and C.R. Mischke
5. Introduction to Engineering Materials by Charles Gilmore

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Classify engineering materials and understand their functional characteristics and standards	1,2	2	Test, Exams
CLO2	Apply the concepts of material selection and performance indices to choose appropriate materials for specific engineering applications	1,2,3	3	Test, Assignment, Exams
CLO3	Analyze the economic aspects of material selection and optimize choices based on cost-benefit analysis.	1,2,7,11	4	Test, Assignment, Exams
CLO4	Evaluate the strength-to-weight ratio of materials and apply this concept to the selection process.	1,2,3	5	Test, Exams
CLO5	Understand and apply the formalized process of material selection, including the use of decision matrices and charts	1,2,5	4	Projects, Exams
CLO6	Discuss the applications and limitations of various materials such as steel, cast iron, non-ferrous materials, plastics, and ceramics.	1,2,3	3	Exams
CLO7	Conduct investigations to compare the performance of different materials in specific applications.	1,2,4	5	Project, Exams
CLO8	Communicate effectively the rationale for material selection in written and oral forms.	1,10	3	Project Exams
CLO9	Understand the environmental and societal impacts of material selection and demonstrate knowledge of sustainability	1,6,7	4	Exams
CLO10	Demonstrate commitment to ethical principles in the selection and use of engineering materials.	1,8	3	Exams

Grading Standard

- Assignments: 10%
- Project: 10%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE554 (2 Units; Core; L = 30)

C**ourse Title:** Mechanics of Deformable Bodies

Contact Hour: 2 Hours per week **Pre-requisite:** MEE328

Contact Time/Venue: Mon, 2 – 4pm, R103 **Semester:** First

Lecturer in-charge**: Engr. Dr. I. C. Ugwuoke**

Course Overview

Mechanics of deformable bodies deals with the study of resulting stresses and strains developed in bodies subjected to external forces. Engineers and other scientists, apply such knowledge in the design of systems such as automobiles, missiles, aircrafts, ships, submarines, machines, etc. In theory, this course describes the use differential equations and solutions for the investigation of bodies of different shapes and materials, under different conditions of stress and strain, caused by the action of various external forces.

Course Contents

Stress and strain; Compatibility; Transformation; Hook's law; Elastic energy; Stresses in beams, columns, and torsional members; Yield and fracture; Elastic deformation of beams; Statically indeterminate systems; Concept of stability.

Recommended Texts

1. Subhayan D. E., Mechanics of Deformable Bodies, Spring, 2018.
2. Sanjay Govindjee, Engineering Mechanics of Deformable Solids, Oxford University Press, 2013.
3. Lecture Notes on Mechanics of Solids, Jntuh-R13.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Understand the Concept of Stress and Strain	1,2	2	Test, Exams
CLO2	Understand the Concept of Compatibility Equations	2,3	4	Test, Exams
CLO3	Understand Stress Transformations	1,2,3	5	Test, Exams
CLO4	Understand Hook's Law	2,4	3	Test, Exams
CLO5	Understand the Concept of Elastic Energy	1,2	2	Test, Exams
CLO6	Analyze Stresses in beams	2,4	5	Test, Exams
CLO7	Analyze Stresses in Columns	1,2	2	Test, Exams
CLO8	Determine Stresses in Torsional members	2,3	4	Test, Exams
CLO9	Understand the Concept of Yield and Fracture	2,4,11	5	Test, Exams

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO10	Understand Elastic Deformation of Beams	1,3	3	Assignment, Exams
CLO11	Understand Statically Indeterminate Systems	2,3,4	4	Assignment, Exams
CLO12	Understand the Concept of Stability	2,3	4	Assignment, Exams

Grading Standard

- Assignments: 10%
- Project: 10%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE 532 (2 Units; Elective; L = 30) **Course Title:** Operations Research

Contact Hour: 2 Hours per week **Pre-requisite:** Nil

Contact Time/Venue: Fri. 9 – 11am, R213 **Semester:** First

Lecturers in-charge: Engr. Prof. K. C. Bala

Course Overview

Operations research (also known as operational management and Management science) is a course that deals with the application of mathematical and logical methods to improve efficiency and help solve managerial problems in business and administration. It approaches problems in a scientific way and so involves measurement, the construction of models and testing. The course would enable final year engineering students have capabilities for analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints. Operations Research combines mathematical modelling techniques with the principles of optimization to identify the most effective and efficient components of a work system. Continuous Systems Optimisation, Discrete Systems Optimisation, Mathematical programming, Network flow analysis, Queuing theory and Engineering statistics are some of the key areas of Operations Research.

Course Contents

Introduction to operation research (OR). History, definition, operations research models, phases of implementing operations research in practice. Scope and application of operation research. Linear programming (LP). Graphical solution method. Simplex methods of solution. Dual solution and interpretation. Sensitivity analysis. Queuing theory and applications. Games theory. Network Analysis. Preparation of network. Critical path method (CPM). Programme evaluation and review technique (PERT) analysis. Use of computer packages for LP, CPA, PERT. Inventory control and models (deterministic). Decision theory. Assembly line balancing and line of balance analysis. Examples of operations research applications to engineering problems

Recommended Texts

1. Winston. W. L. Operations Research: Applications and Algorithm. Cengage Learning. 4th Edition, 2003
2. John S. C. Operations Research – A First Course. Pergamon, 1980.
3. Wilkes, F. M. Operations Research – Analysis & Applications. McGraw-Hill, 1989.

4. Paul R. Thie. An Introduction to Linear Programming and Game Theory
5. Larry M. A. & James R. B. Management Science – An Aid for Managerial Decision making. Prentice Hall, 1985.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Identify and formulate a Linear Programming Problem (LP) model	1,2	2	Test, Exams
CLO2	Understand the need of inventory management	2,3	4	Test, Exams
CLO3	Develop linear programming models for service and manufacturing systems	1,2,3	5	Test, Exams
CLO4	Describe optimal solution for Linear Programming problems	2,4	3	Test, Exams
CLO5	Explain linear programming models by graphical and simplex methods,	1,2	2	Test, Exams
CLO6	Perform Sensitivity Analysis on Linear Programming problems,	2,4	5	Assignment, Test, Exams
CLO7	Determine the best strategy and value of a given game model	1,2	2	Test, Exams
CLO8	Explain the principles of Network flow analysis	2,3	4	Test, Exams
CLO9	Utilize computer softwares WINQSB, QM and TORA to solve network models and games	2,4,11	5	Project, Exams
CLO10	Identify the most effective components of a work system during ranking	1,3	3	Assignment, Exams
CLO11	Apply CPM and PERT techniques, to plan, schedule, and control project activities	2,3,4	4	Assignment, Exams
CLO12	Determine the best strategy and value of a given game model	2,3	4	Assignment, Exams
CLO13	Apply the appropriate queuing model for a given practical application	1,5	3	Assignment, Exams

Grading Standard

- Assignments: 10%
- Project: 10%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE 572 (2 Units; Elective; L = 30)

Course Title: Auto-Systems & Vehicle Dynamics

Contact Hour: 2 Hours per Week

Contact Time/Venue: Tuesday, 8 – 10 am/LR 301

Semester: First

Lecturer in-charge: Engr. Dr. S. A. Ayo

Course Overview

Auto-System and Vehicle Dynamics covers enumeration of the various force and moment systems in the plane along the longitudinal direction of the vehicle, the analysis of the force and moment systems to determine axle loads for various configurations of the vehicle. The method of evaluation the axle load and the axial load change are treated. The course also covers the analysis of the maximum acceleration and breaking performance for various configurations of the vehicle (rear-wheel drive, front-wheel drive and all-wheel drive). The dynamics of the force-moment systems of the vehicle in the lateral axis are also covered in the course. These include the lateral load transfers without suspension effect, with the effect of suspension, and stability of vehicles on curved path for various conditions. Also covered in the course is motor vehicle brake system, types of the brake system and analysis for the braking performance parameters such as actuating force, braking torque and hinge pin reactions. Demonstration of the methods of evaluation the performance models to achieve a design is also included. In view of the rapid dynamics of development in automotive design and maintenance requirement, it is very important that the students are exposed to basic principles of Auto-Systems and Vehicle Dynamics to prepare them for the evolving technology in the field. In this way the country would be matching towards fulfilling goals 8 and 9 of UN SDG2030 for industry, innovation and economic growth.

Course Content

Friction forces in automobile systems; Drag and propelling forces; Effect of body shape on vehicles; Braking system design & analysis and power transmission system; Tyres, design, factors affecting tyre wear rate, effect of tyre pressure on road traction.

Recommended Texts

1. Fundamentals of Vehicle Dynamics by Thomas D. Gillespie

2. Vehicle Dynamics: Theory and Application by Reza N. Jazar
3. Basic Automobile Engineering: Theory and Practical by Government of Tamil Nadu, Tamil Nadu Textbook and Educational Services Corporation
4. Vehicle Dynamics and Control by Rajesh Rajamani, Second Edition, Springer
5. The Crawfords Auto Repair: A guide to Beginner's Auto maintenance and Repair by Jeff Crawford
6. Automotive Engineering: Power Train, Chassis System and Vehicle Body edited by David A. Crolla, Elsevier

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	State and describe various forces and moments systems in the longitudinal plane of a vehicle in motion (PO1), their conventions and laws for analysing them	1	2	Test, Exam
CLO2	Describe the methods of and carry out analysis of the force-moment systems (PO2) and develop the relevant expressions for the axle loads and longitudinal load transfer (PO3) under the vehicles different conditions	2, 3	4	Test, Exam
CLO3	State the factors limiting the acceleration performance (PO1) and carry out analysis of the maximum acceleration and braking performance (PO2) to derive expressions for the performance parameters (PO3)	1, 2, 3	4	Test, Exam
CLO4	Describe transverse weight shift due to drive torque (PO1), analyse the impact of the weight shift on axle loads for front- and rear-wheel drives (PO2) and derive the relevant performance equations (PO3). Apply the resulting lateral load transfer on the acceleration and braking performance (PO4)	1, 2, 3, 4	5	Assignment, Project, Exam
CLO5	Explain lateral load transfer (PO1) and describe the methods of analysis for motion on curved path without and with suspension effects to determine performance parameters (PO2). Demonstrate the procedure for evaluating the performance parameters (PO4).	1, 2, 4	5	Test, Exam
CLO6	Explain the principle of motor vehicle braking, stating the types of the system and describing the features and mechanism of operation of drum brake system (PO1)	1	2	Test, Exam

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO7	Carry out analysis of drum brake system (PO2) and derive expressions for the brake performance parameters such as the actuating force, the torque, and the support reactions (PO3). Demonstrate the procedure of evaluating the performance parameters (PO4)	2,3,4	5	Assignment, Quiz, Exam
CLO8	Describe the features, design of a typical tyre and types. State the factors affecting tyre wear rate and the effect of tyre pressure on road traction (PO1).	1	2	Test, Exam

Grading Standard

- Assignments: 10%
- Project: 5%
- Quiz: 5%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE 571 (2 Units; Core; L = 30)

Course Title: Energy Studies and Environment,

Contact Hour: 2 Hours per week **Pre-requisite:** None

Contact Venue: Mon, 10 - 12pm, R305 **Semester:** First

Lecturers in-charge: Engr. Prof. O. J. Okegbile

Course Overview

The study of Energy, Economy and Ecology as they relate to one another is very important. Options of various energy resources need to be studied for reasons of choice and impact on the environment. The world needs to shift from non-renewable to renewable energy sources. Non renewable energy sources will deplete and are mostly not environment friendly. With this study adequate alternative may be planned for where studies have shown that a particular resource will deplete.

Course Contents

Analysis of energy demand in society; Types, grades, and applications; Sources and resources; Energy conservation, conversion, combustion; Nuclear fission and fusion; Hydroenergy; Alternative sources of energy; Solar, geothermal, wind, and tides; Biomass Economic, environmental, political and social considerations.

Recommended Texts

1. Hinrichs, Roger A. and Kleinbach, Merlin H. Energy: Its Use and the Environment

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Analysis of energy used from various energy resources	1,2	3	Assignment, Exams
CLO2	Projection analysis of the use of energy	2,3	4	Assignment, Exams
CLO3	Energy depletion analysis ofr non-renewable enrgy sources	1,2,3	3	Assignment, Exams
CLO4	Analysis of Solar Energy systems	2,4,7	4	Assignment, Exams

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO5	Analysis of Hydropower energy system	1,2	4	Assignment, Exams
CLO6	Fuels and analysis of Combustionof fuels	2,3	5	Assignment, Quiz, Exams
CLO7	Review of Combustion calculations	2,4,11	5	Project, Exams
CLO8	Review of Environmental impacts of energy exploration	1,3	3	Assignment, Exams
CLO9	Ebergy review from Nuclear power	2,3,4	4	Assignment, Exams
CLO10	Tidal energy review	2,3	4	Assignment, Exams
CLO11	Revision of all lectures	1,5	3	Assignment, Projects

Grading Standard

- Assignments/Projects: 20%
- Continuous Assessment: 20%
- Semester Examination: 60%

SECOND SEMESTER

Course Code: EET 222 (2 Units; Core; L = 30)

Course Title: Engineering Thermodynamics

Contact Hour: 2 Hours per Week

Contact Time/Venue: Tuesday, 11 am – 1 pm/LT 1

Semester: Second

Lecturers in-charge: Engr. Dr. S. A. Ayo, Engr. Dr. I. Bori, & Engr. Muideen

Course Overview

Engineering Thermodynamics covers the various concepts used in thermodynamics, thermodynamic properties, thermodynamic processes and various forms of energy. These include systems and types, thermodynamic state, thermodynamic equilibrium, reversible and irreversible processes, thermodynamic cycle, energy, heat and work, and heat reservoir. The course also encompasses the laws of thermodynamics and their consequences; the derivation of the guiding relations and their applications. These include zeroth (0^{th}), 1^{st}, and 2^{nd} laws, the non-flow energy equations, the steady flow equation, the emergence of internal energy and entropy as thermodynamic properties. It also includes the concepts of heat engine and thermal efficiency, refrigeration and heat pump cycles, and coefficient of performance. The course also covers property relation for perfect gases and phase-change processes and the application to various processes and systems. The course also treats the application of the combined 1^{st} and 2^{nd} laws of thermodynamics to various processes and systems. A successful administration of the content of the course to students should equip them with the knowledge to be able to solve problems relating to analysis and design of thermodynamic systems such as power plant systems, refrigeration and heat pump systems and evaluation of their performance. This should ultimately lead to self-reliance of our country in terms of design and maintenance of these systems, contribute to the economic growth, and ensure enhanced quality of life of the citizen and, thus, partly or wholly addressing goals 1, 2, 3, & 8 of the UN SDG 2030.

Course Content

Basic concepts and definitions: Thermodynamics, matter, space, time and their properties, working substance, pure substance, fluid, system, surroundings, property and state, dimensions

and units, mass and weight, temperature and zeroth law, thermodynamic process (cyclic), reversibility. Energy concept, definition and types, work and heat, first law of thermodynamics and consequences. The non-flow energy equation and application to non-flow processes. The steady-flow energy and application to open systems. Second law of thermodynamics: Heat engine, efficiency process, efficiency, statements due to Plank, Kelvin and Claussius, Carnot principle. Thermodynamic temperature scale, reversibility and irreversibility, entropy. Properties of pure substance and property relations for a perfect gas. Application of combined first and second laws to various systems and processes and to perfect gases and systems.

Recommended Texts

Textbooks

1. Engineering Thermodynamics by G. F. C. Rogers and Y. R. Mayhew
2. Thermodynamics – An Engineering Approach by Yunus A. Cengel and Michael A. Boles
3. Thermodynamics for Engineers – Theory and Problems – (Schaum's Outline Series) by Merle C. Potter, Graig W. Somerton
4. Property Tables – Thermodynamic and Transport Properties of Fluid (S. I. Units) by Rogers and Mayhew
5. Property Diagrams (*P-v*, *T-v*, *P-T*, *T-s*, *P-h*, *P-v-T*, etc.) and Property Charts, e.g. *h-s* or Mollier Chart

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	State the basic concepts and describe thermodynamic properties and states of a system, thermodynamic equilibrium, processes and applications (PO1). Solve problems of thermodynamic processes undergone by a system (PO4)	1, 4	2	Test, Exam
CLO2	Explain the concept of energy, heat and work, stating the different forms of energy, modes of heat and work transfer, and the reversibilities of the transfers (PO1)	1	2	Test, Exam
CLO3	State the laws of thermodynamics and explain the consequences of the zeroth (PO1). Also state the consequences of the 1st laws, and the emergency of internal energy as a property (PO2). State the non-	1, 2, 4	4	Test, Exam

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
	flow energy equation and apply to various processes. Solve problems with the 1st law for cyclic process and non-cyclic process (PO4)			
CLO4	Analytically apply the 1st law to a flow process and derive the resulting steady flow energy equation (*SFEE*) (PO2). Apply to various processes and solve problems with the *SFEE* for various processes and systems (PO4).	2, 4	5	Assignment, Project, Exam
CLO5	State the 2nd law of thermodynamics and the consequences (PO1), performing analysis that yields entropy as a property (PO2). State the concepts of irreversibilities, heat engine, thermal efficiency, refrigeration and heat pump systems and the coefficient of performance (PO1)	1, 2	4	Test, Exam
CLO6	Analytically derive expressions for thermal efficiency, coefficient of performance (PO2 & PO3) and apply to solve problems to evaluate the performance parameters for a heat engine, refrigeration cycle and heat pump cycle (PO4).	2, 1, 4	5	Assignment, Exam
CLO7	Derive property relations for perfect gases utilizing 1st and 2nd laws (PO2 & PO3). Explain property diagrams and tables for phase-change processes (PO1)	1, 2, 3	4	Assignment, Quiz, Exam
CLO8	Apply the combined 1st and 2nd laws to various processes and systems of ideal gases and water (PO2) and solve problems for the processes and systems (PO4).	2, 4	3	Test, Exam

Grading Standard

- Assignments: 10%
- Project: 5%
- Quiz: 5%
- Test: 20%
- Semester Examination: 60%

Course Code: EET 223 (2 Units; Core; L = 30) C**ourse Title:** Engineering Drawing II

Contact Hour: 2 Hours per week **Pre-requisite:** Engineering Drawing I

Contact Venue: Mon, 2 - 4pm, LT I/ LT II **Semester:** Second

Lecturers in-charge: Engr. Prof. O. A. Olugboji and Engr. Dr. S. S. Lawal

Course Overview

Engineering Drawing is a foundational course designed to equip students with the skills and knowledge necessary to create, interpret, and understand engineering drawings and blueprints. This course covers the principles of technical drawing, including the use of various drafting tools, techniques, and software. Students will learn how to produce accurate and detailed representations of mechanical, electrical, and architectural designs.

Course Contents

Project of points, line and solids. Orthographic projections. First and third angle projections; Auxiliary projections, Isometric and oblique projections. Dimensioning, sectional at views: Threaded fasteners; free-hand sketching to more complex engineering components. Introduction to assembly drawing, (IL, 1P).

Recommended Texts

1. Frederick E. Giesecke, Shawna Lockhart, Marla Goodman, & Cindy Johnson. **Technical Drawing with Engineering Graphics**, 2023.
2. Gary R. Bertoline & Eric N. Wiebe. **Fundamentals of Graphics Communication. 8th Edition**, 2023.
3. Basant Agrawal & C.M. Agrawal, **Engineering Graphics,** 2019
4. N.D. Bhatt & V.M. Panchal **Principles of Engineering Graphics and Drawing**, 2018.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Understand the importance and application of engineering drawings in the engineering field	1,2	3	Assignment, Exams
CLO2	Master the use of lines, shapes, and angles in technical drawings	2,3	4	Assignment, Exams

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO3	Learn techniques for creating isometric, oblique drawings and understand how to represent three-dimensional objects on two-dimensional media	1,2,3	3	Assignment, Exams
CLO4	Demonstrate the ability to create accurate and detailed hand sketches and drawings.		4	Assignment, Exams
CLO5	Produce and interpret sectional views to show interior details of components.	1,2	4	Assignment, Exams
CLO6	Accurately dimension and tolerance drawings according to engineering standards.	2,3	5	Assignment, Test, Exams
CLO7	Communicate technical information effectively through drawings and annotations.	2,4,11	5	Project, Exams
CLO8	Manage revisions and maintain proper documentation for engineering drawings.	1,3	3	Assignment, Exams

Grading Standard

- Assignments/Projects: 20 %
- Test: 20 %
- Semester Examination: 60 %

Course Code: MEE 225 (2 Units; Core; L = 30) **Course Title:** Workshop Practice

Contact Hour: 2 Hours per week **Pre-requisite:** Nill

Contact Venue: Mon, 4 – 6 pm, LT II/ LT I **Semester:** Second

Lecturers in-charge: Engr. Prof. O. Olugboji and Engr. Dr. I. C. Ugwuoke

Course Overview

The Workshop Practice course is designed to provide students with hands-on experience and practical skills in a variety of engineering and manufacturing processes. This course introduces students to fundamental workshop tools, machinery, and techniques used in the industry. Emphasis is placed on safety procedures, precision, and the effective use of tools

Course Contents

Elementary introduction to types and organization of engineering workshop (jobbing, batch and mass production). Safety in workshop and safety practices with various workshops' tools. Bench work and fittings: Measurements and markings for benchwork with hand tools and instruments. Practical demonstrations of hand tools/instruments in bench works and fittings. Carpentry: Hand tools and their applications in making various joints' types in timber/wooden materials. Blacksmithing: Hand tools used and their working principles and applications for making simple engineering components by bending, upsetting e.t.c. operations. Standard measuring tools such as vernier caliper and micrometer gauges e.t.c used in the workshops. Welding processes: Descriptive features and principles of operations of welding equipment for arc welding, gas welding brazing and soldering Engineering materials: Definitions, types of engineering materials: Uses, mechanical and mechanical properties. General principles of working of standard metal cutting machines' tools and the practical applications on such machines. Simple individual small projects in the above workshop practices are required. (IL, 1P)

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Recommended Texts

1. W.A.J. Chapman. **Workshop Technology, Volume 1**, 2019.
2. Richard Fox. **Workshop Practice Manual.** 2020
3. Rob Thompson. **Manufacturing Processes for Design Professionals**, 2019.
4. K.C. John. **Modern Engineering Workshop Practice**.2018

5. K.L. Narayana & M.K. Natarajan. **Practical Workshop Technology** 2018

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Understand and apply safety regulations and best practices in a workshop environment.	1,2	3	Assignment, Exams
CLO2	Analyze and learn to read, interpret technical drawings and blueprints.	2,3	4	Assignment, Exams
CLO3	Plan and execute workshop projects from start to finish, ensuring accuracy and quality.	1,2,3	3	Assignment, Exams
CLO4	Demonstrate proper use of workshop tools and equipment	2,4,7	4	Assignment, Exams
CLO5	Follow safety protocols to prevent accidents and injuries	1,2	4	Assignment, Exams
CLO6	Accurately use measuring instruments such as calipers, micrometers, and gauges.	2,3	5	Assignment, Quiz, Exams
CLO7	Understand and apply proper techniques for handling and storing different workshop materials.	2,4,11	5	Project, Exams
CLO8	Perform routine maintenance and troubleshooting of workshop equipment.	1,3	3	Assignment, Exams
CLO9	Perform basic fabrication tasks, including cutting, drilling, and shaping materials.	2,3,4	4	Assignment, Exams
CLO10	Operate basic machining equipment such as lathes, milling machines, and grinders	2,3	4	Assignment, Exams

Grading Standard

- Assignments/Projects: 40 %
- Continuous Assessment: 20 %
- Semester Examination: 40 %

Course Code: MEE 320 (3 Units; Core; L = 30)

C**ourse Title:** Engineering Mathematics

Contact Unit(s)our: 3 Hours per week **Pre-requisite:** EET 221

Contact Venue: Monday, 10-1pm, Rm102 **Semester:** Second

Lecturers in-charge: Engr. Dr. A. A. Abdullahi and Engr. Dr. A. B. Gambo

Course Overview:

This course cover Fourier series, series solutions of Differential Equations; Line, multiple integral as well as Vector theory focusing on applying the theoretical knowledge for the solutions of physical and Engineering problems. Fourier series are infinite series that represent periodic functions in terms of cosines and sines.

Outline of the Course:

Fourier series – Euler coefficients, even and odd functions, Sine and Cosine functions, simple applications. Gamma, Beta and probability functions. Differential equation of second order – series solutions. Legendre and Bessel functions and their properties. Vector theory – Dot product, cross product, divergence, curl and Del operators. Gradient. Line, Surface and volume integrals and related theorems. Solving problems using Mechanical Engineering case studies.

Recommended Textbooks:

Kreyszig, E., Kreyszig, H., & Norminton, E. J. (2021). *Advanced Engineering Mathematics*, 10th Edition, Johnwiley & Sons

Spiegel, M. R. (1971). *Advanced Mathematics for Engineers and Scientists*, Schaum's outline series, McGrawHill, New Youk.

Stroud, K. A. (1996). *Further Engineering Mathematics*, 3rd Edition, Macmillan, London.

Stroud, K. A. (1996). *Engineering Mathematics, 3rd Edition*, Macmillan, London.

Course Learning Outcomes:

CLO	**Course Learning Outcome**: Upon successful completion of the course, student will be able to:	POs	Bloom's Taxonomy Level	Assessment Tools
1.	Understand the concept of Fourier series and evaluation of the Euler coefficients.	1	2,5	Quiz, Homework, Exams.

CLO	**Course Learning Outcome**: Upon successful completion of the course, student will be able to:	POs	Bloom's Taxonomy Level	Assessment Tools
2.	Analyse period, even and odd functions as well as Numerical Harmonic analysis of giving set of values.	2	4	Quiz, Exams.
3.	Apply periodic function characteristics to efficiently determine the Fourier series representation of given function(s) or waveform.	2	3	Quiz, Homework, Exams.
4.	Apply series solutions technique for the solution of second order Differential Equations.	2	3,5	Quiz, Homework, Test, Exams.
5.	Analyse integral functions (Gamma and Beta functions), Legendre and Bessel functions and their properties.	1,2	1,2	Quiz, Homework, Test, Exams.
6.	Apply Vector calculus for solutions of physical and Engineering problems.	1,2	3	Homework, Exams.
7.	Understand the concept of Line, multiple integrals and related theorems. Apply these theorems for Solving Mechanical Engineering Problems.	1,2	3	Homework, Test, Exams.

Grading Standard:

Homework and Quizzes: 20%

Mid-Semester Examination (Test): 20%

Semester Examination (Exams): 60%

Course Code: MEE 322 (2 Units; Core; L = 30)

Course Title: Thermodynamics II,

Contact Hour: 2 Hours per week **Pre-requisite:** Thermodynamics I

Contact Time/Venue: Wednesday, 10 - 12pm, R203 **Semester:** Second

Lecturers in-charge: Engr. Prof. N. A. Musa & O.M. Oyebamiji

Course Overview

Thermodynamics II delves into thermodynamic cycles; Vapour power cycles and Gas power cycles such as Air standard, Otto, Carnot and Diesel cycles etc, the course focus on the analysis and performance of heat engines and refrigeration such as heat pump, gas turbine and reciprocating engines. This course equips students with essential knowledge for understanding and applying thermodynamic principles in various practical contexts, such as air conditioning and energy systems. By offering this course, graduates will develop skills necessary to contribute to sustainable engineering solutions, enhancing the quality of life and supporting the attainment of goals outlined in Agenda 2063 and the Sustainable Development Goals (SDG 2030).

Course Contents

Properties & property diagrams of liquids & vapours; Vapour power cycles: Carnot, Rankine, Reheat, Regenerative, Binary cycles, Back pressure & extraction turbines, nuclear power plant, etc. Gas power cycles: Gas turbine engines; The simple gas turbine cycle, gas turbine cycles with heat exchange, intercooling and reheating, etc.; Reciprocating engine cycles: Otto cycle, Diesel cycle, Dual cycle, etc.; Heat pump and refrigeration cycles.

Recommended Texts

1. Cengel, Y.A., & Boles, M.A. Thermodynamics: An Engineering Approach. McGraw-Hill, 2019.
2. Moran, M.J., Shapiro, H.N., Boettner, D.D., & Bailey, M.B. **Fundamentals of Engineering Thermodynamics**. Wiley, 2018.
3. Sonntag, R.E., Borgnakke, C., & Van Wylen, G.J. **Fundamentals of Thermodynamics**. Wiley, 2017.
4. Holman, J.P. **Heat Transfer**. McGraw-Hill, 2010.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Comprehend the properties and property diagrams of liquid and vapour.	1,2	3	Test, Exams
CLO2	Classify thermodynamic cycles based on power generation and refrigeration.	2,3	4	Test, Exams
CLO3	Explain the principles of thermodynamic cycles such as Carnot, Otto, Diesel and constant pressure cycles	1,2,3	3	Test, Exams
CLO4	Evaluate the working principles and performance Carnot, Otto, Diesel engines and compare them with air-standard cycles	2,4,7	4	Assignment, Project, Exams
CLO5	Apply Joule Brayton principles in analysing gas turbine cycles and constant pressure cycles	1,2	4	Assignment, Exams
CLO6	Understand and solve complex problems related to any of the thermodynamic cycles such as power and refrigeration cycles.	2,3	5	Assignment, Quiz, Exams

Grading Standard

- Assignments: 10%
- Project: 5%
- Quiz: 5%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE 324 (2 Units; Core; L = 30)

C**ourse Title:** Computer Programming and Engineering Applications

Contact Hour: 2 Hours per week **Pre-requisite:** EET 224

Contact Venue: Wed, 8 -10am, LTII **Semester:** Second

Lecturers in-charge: Engr. Prof. O. J. Okegbile; Engr. Dr. U. G. Okoro

Course Overview

Very little can be achieved globally in all areas of endeavors without adequate applications of computer. A well-prepared engineering graduate will make major difference with good knowledge of computer programming. Many engineering challenges on the field cannot solved fully by existing softwares. It's important therefore to learn how codes are developed from first principles that leads to software development.

Course Contents

Structured programming concepts: Basic and Fortran programming languages. C and C^{++} programming languages. Introduction Visual Basic to object-oriented programming, concepts and applications: Engineering applications of basic, Visual Basic Fortran, C and C^{++} programming languages.

Recommended Texts

1. Byron S.GotteriedProgramming with Sructured Basic(1992),

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Know reserved keywords used in statement writing in BASIC I	1,2	3	Assignment, Exams
CLO2	Know reserved keywords used in statement writing in BASIC II, appropriate syntax writing	1,2	3	Assignment, Exams
CLO3	Practice worked examples of BASIC program writing	1,2,3	3	Assignment, Exams
CLO4	Know reserved keywords used in statement writing in FORTRANI	2,4,7	4	Assignment, Exams
CLO5	Kwowing appropriate syntax wring in Fortran programming	1,2	4	Assignment, Exams
CLO6	Reviewing of worked examples in Foortran programming	2,3	5	Assignment, Quiz, Exams

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO7	Know reserved keywords used in statement writing in C and C++I	2,4,1	5	Project, Exams
CLO8	Reviewing of worked examples in C and C++nprogramming	1,3	3	Assignment, Exams
CLO9	Teaching of Object-oriented programming	2,3,4	4	Assignment, Exams
CLO10	Review of examples in Object-oriented Programming.	2,3	4	Assignment, Exams
CLO11	General review of lectures taken	1,5	3	Assignment, Projects

Grading Standard

- Assignments/Projects: 20%
- Continuous Assessment: 20%
- Semester Examination: 60%

Course Code: MEE 326 (2 Units; Core; L = 30)

Course Title: Metallurgy II

Contact Hour: Two Hours **Pre-requisite:** Material science

Contact Venue: **LT1** **Semester:** Second

Lecturers in-Charge: Prof. N. A, Ademoh

1.0 Senate-approved relevance

Engineering metallurgy I (MEE 326) is jointly offered by mechanical and agric and bio-resources departments. The course is resident in and taught by mechanical engineering dept. It is approved in the curriculum of the two departments by University Senate as required by National Universities Commission BMAS/CCMAS academic standard for the award of B. Eng degrees in Mechanical Engineering and Bio-Resources Engineering.

2.0 Course Overview

MEE 326 is taught at 300 level as one of the second semester courses. The course aimed at giving the students introductory knowledge on the importance of the role of metals and materials in transforming theoretical designs and thoughts into tangible engineering assets through careful selection. It is designed to introduce students to the different classes/types of engineering materials that may be selected for mechanical and agricultural machines. The course further exposes students to heat treatment processes and the needs for heat treating alloys before use. The course enables students to appreciate the interface between design of machine elements and materials needed for design against failure of machine elements.

3.0 Objectives

Objectives of Engineering Metallurgy I a core course to the mechanical and ABE students is for the followings

(a). To introduce the students in their intermediate level of B. Eng degree program is to gradually teach them the knowledge of appreciating different materials available for applications.

(b) To open their knowledge of unique properties distinguishing metallic from non-metallic materials.

(c) To make students to understand the uniqueness of building blocks of crystalline materials and how they differ from amorphous materials.

(d) To teach students classes of lattice spaces in materials and how they determine properties

of materials. (e) To introduce students to the types of metal alloys based on the forming process.

(f) To give students basic knowledge on classes of crystals and how the enclosed angles between the axes with vector magnitude of the three axes can be used to identify the classes.

(g) To introduce students to heat treatment processes.

4.0 Course Learning Outcomes

The expected outcome of students after taking the course include but not specifically limited to the following: :

(a) The student would be able to classify materials based on the stress/strain curves.

(b) The student would be able to classify engineering materials into metals and non-metals.

(c) The student would also be able to classify metallic materials into ferrous metals and non-ferrous materials.

(d) The beneficiary of the course would be able to comfortably distinguish between amorphous and crystalline materials based on melting points and give typical characteristics of the two materials.

(e) Student would be able to classify plastics into five distinct types and note the uses for each type.

(f) Student would be able to tell the characteristics of plastics and rubbers as types of elastomers.

(g) Would know the compositions/characteristics of intermetalic compounds which include ceramics, cerments and semiconductors and the general engineering uses of the materials.

(h) Know symmetrical materials, planes/axes of symmetry and engineering relevance of it.

(i) Have good knowledge of the seven crystalline systems that any material may belong.

(j) The student would know angular and vector magnitudes of each crystalline system.

(k) Students would be able to use Miller notation/indexing to locate planes in within a crystal lattice.

(l) Students would have learnt about metallic crystal and atomic arrangements in a crystal lattice.

(m) Students would know why some metals are brittle while others are ductile and tough based on the atomic packing in the lattice space.

(n) The learner would know different packing systems in atomic heaping to form crystals.

(o) Students would be introduced to principles of nucleation, grain growth as processes involved in metal solidification.

(p) Would have learnt about dedritic and planar crystals are formed from solidifying molten metal.

(q) Would have been introduced to the mechanism of alloy formation processes of substitution, interstices and intermetalic compounds.

(r) Would have been introduced to solid solution formation in metal alloys.

(s) Students would have been thought about the guiding rules of alloy formation.

(t) Students would have been introduced to the varying physical and mechanical properties of metal alloys by heat treatment.

5.0 Course Content

Review of material property by reference to stress/strain test curves of materials, stiffness, brittle, ductile, elastic and plastic regions. Classification of engineering materials, metals and alloys; intermediate materials, ceramics, cerments, semiconductors, plastics, rubber and non metallic materials, properties and uses; Crystal classes, crystal systems, Miller notation and crystalline planes. Metallic crystals arrangements of atoms in metal crystal lattice and atomic spacing in metal crystals. Solidification of metal, homogenous and heterogeneous nucleation, grain growth, planar and dendritic alloy grains systems. Metallic alloy formation, mechanism of alloy formation, solid solution in metals, substitutional, interstices alloy systems and intermetalic compounds, Rules of solid solution formation, Binary alloy phase diagram showing total solid solubility, partial solid solubility and total solid insolubility alloy systems. Effects of alloy types on properties. Effects types of heat treatments on alloys. .

6.0 Minimum Academic Standards

The students taking this course must have passed materials science at 200 level. Students must be prepared to learn new terminologies as applied to the course.

7.0 Recommended Textbooks:

(a) Engineering metallurgy (any author available)

(b) Metallurgy for engineers (any author available)

(c) Materials science (any author available)

(d) Online sources (any author available)

(e) MEE 326 Lecture Notes

Course: MEE 327 **Course Title:** Laboratory Practical III
Course Unit (s): Three (3) **Time:** 3 Hours Contact Time Per Week

Semester: SECOND **Location:** Mechanical Workshop, TETFUND Lab. and Metallurgical lab.

Pre – requisites: N/A Status: Compulsory

Instructor (s): Engr M.O Oyebamiji, Dr. Garba, Dr. Osayi, Engr. kazeem Bello, & Engr. Sulaiman

Course Overview and Description

The course is essentially a laboratory work involving laboratory experiments practical designed to familiarise students with various experimental skills. This practical course aims to provide hands-on experience in refrigeration and heat pumps, pneumatic systems, metallurgy, and welding. Students will develop problem-solving skills, critical thinking, and technical expertise through experimentation and real-world applications.

Outlines of Course

A laboratory course work involving laboratory experiments and practical in the following courses: Thermodynamics, Manufacturing Technology, Engineering Metallurgy, Heat transfer and Computer Programming.

RECOMMENDED TEXTS:

Cengel, Y. A. (2019). Refrigeration Systems and Applications. McGraw-Hill Education.

Stoecker, W. F. (2018). Industrial Refrigeration Handbook. McGraw-Hill Education

Yu Lakhtin (1998): engineering physical metallurgy

Johnson, C. (2017). Pneumatic Systems: Principles and Applications. CRC Press.

Ning, S. (2019). Pneumatic Control Systems. Springer.

Course Learning Outcomes:

CLO	Learning Outcomes: Upon successful completion of the course students will be able to:	POs	Bloom Taxonomy Level	Assessment Tools
1.	Design, analyze, and test refrigeration and heat pump systems	1,3	1	Practical and report writing from experiment(s).

CLO	Learning Outcomes: Upon successful completion of the course students will be able to:	POs	Bloom Taxonomy Level	Assessment Tools
2.	Understand and apply pneumatic principles in industrial applications. . .	1,3	2	Practical and report writing from experiment(s). Practical and report writing from experiment(s).
3.	Identify and analyze metallurgical properties and processes	5	4	Practical and report writing from experiment(s).
4.	Demonstrate welding techniques and safety protocols	2	3	Practical and report writing from experiment(s).
5.	Apply theoretical knowledge to practical problems	1,3	2	Practical and report writing from experiment(s).

GRADING STANDARD:

Practical and report writing from experiment(s). (100%)

Assessment: Practical Reports (40%)

- Quizzes and Tests (20%)

- Group Projects (20%)

- Individual Participation and Attendance (20%)

Course Code: MEE 313/328 (2 Units; Core; L = 30)

C**ourse Title:** Machine Drawing and Design,

Contact Hour: 2 Hours per week **Pre-requisite:** Engineering Drawing II

Contact Venue: Monday/ Tuesday, 8 – 10 am, LT I/R102 **Semester:** First/Second

Lecturers in-charge: Engr. Prof. O. A. Olugboji

Course Overview

Engineering Drawing is designed for students who have a foundational understanding of engineering graphics and seek to deepen their expertise in creating and interpreting complex technical drawings. The course focuses on advanced techniques, industry standards, and practical applications, preparing students for professional engineering roles

Course Contents

Conventional representations, Standards and their application to design; Surface finish symbols and their application to design; Assembly drawing, part-lists; Principal and sectional views of assemblies; Part-drawings; Disassembly of machine mechanisms; Detailing design for production including fasteners, knuckle joints, universal joints and creation of part and assembly drawings to machine components, engine parts, etc. General conventions; Limits and fits; Geometrical tolerances; Cam profiles; Gear tooth profiles; Drawing office organization.

Recommended Texts

1. N.D. Bhatt & V.M. **Panchal Principles of Engineering Graphics and Drawing**, 2018.
2. Basant Agrawal & C.M. Agrawal, **Engineering Graphics,** 2019
3. Colin H. Simmons, Dennis E. **Maguire & Neil Phelps. Manual of Engineering Drawing: British and International Standards,** 2018.
4. Frederick E. Giesecke, Alva Mitchell, Henry C. Spencer, Ivan L. Hill, & John T. Dygdon. **Technical Drawing with Engineering Graphics**, 2018.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Revision of fundamental drawing techniques, Isometric, oblique, and perspective projections.	1,2	3	Assignment, Exams
CLO2	Enhance skills in producing precise and detailed engineering drawings using both manual and computer-aided design (CAD) tools	2,3	4	Assignment, Exams
CLO3	Create and interpret detailed assembly drawings, including exploded views, part lists, and bill of materials (BOM).	1,2,3	3	Assignment, Exams
CLO4	Utilize advanced CAD software to create 3D models and visualize complex engineering designs	2,4,7	4	Assignment, Exams
CLO5	Gain a thorough understanding of GD&T principles, symbols, and their application in ensuring proper fit and function of parts	1,2	4	Assignment, Exams
CLO6	Improve skills in technical communication, focusing on clarity, accuracy, and precision in conveying design intent through drawings.	2,3	5	Assignment, Quiz, Exams
CLO7	Learn and apply current industry standards and conventions in engineering drawing, including ISO and ANSI standards.	2,4,11	5	Project, Exams

Grading Standard

- Assignments/Projects: 20 %
- Continuous Assessment: 20 %
- Semester Examination: 60 %

Course Code: MEE 523 (2 Units; Core; L = 30) C**ourse Title:** Entrepreneurship Studies II

Contact Hour: 2 Hours per week **Pre-requisite:** Nil

Contact Time/Venue: Thursday, 8 – 9am, R213 **Semester:** Second

Lecturers in-charge: Engr. Dr.Sadiq S.Lawal

Course Overview

Entrepreneurship is an emerging study in response to the prevailing reality of equipping the final year student competence-based enterprises by process of creating value to solve human needs by building systems and structures that deliver value in an innovative and creative way. The process involves identifying a problem, finding the solution to the problem, and sourcing resources (both financial and human) bearing all the risks involved in bringing the solution to reality. The students will understand the management and leading style that involves pursuit of opportunity irrespective of resource in control and attempt at business or venture creation or expansion of existing business by individual, team or establishment. A way of thinking that is opportunity obsessed, holistic in approach and leadership balance for value creation. At the centre of every entrepreneurial journey is the entrepreneur who is someone (or a group of people) who starts a business based on a unique idea that provides a creative and innovative solution to meet consumer needs and increase the value they derive from a product or service. This is done with the hope of making a profit.

Course Contents

Introduction to Entrepreneurship and Developing Entrepreneurial competencies: What is Entrepreneurship, roles, resources and competencies (to be or not to be, Goal setting, Pearl exercise).

Entrepreneurial team: Teams importance, Individual and teams, A winning team, Ream's roles (Flying Eggs)..

Development of Individual Marketing Strategies 5Ps (Mini Market, Bazaar, Match Box Heroes)

Innovations: Determinants of Innovation, Innovation Process in New Ventures (Flying Eggs, Brainteaser, Scamper Model).

Analysis of Business ideas, SWOT Analysis (Round Robin, Macro/micro screening, check it out)

Development of Business Proposals (Business Plan) and Business Model Canvas

Break-Even Analysis

Recommended Texts

1. CEFE Training Manuals 2023

2. FUT Minna Entrepreneurship Inspite, Ctreate and Start Modules. SME Sabi 2023/2024

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Understand convincingly what Entrepreneurship is all about and the objectives of creating values proposition	1,2	2	Test, Exams
CLO2	Analyze the roles of resources and entrepreneurship competences in setting up business goals	2,3	4	Test, Exams
CLO3	Evaluate the inspiring effects of the various stimulating exercises in creating and starting up a business.	1,2,3	5	Test, Exams
CLO4	Apply their training and skills of being creative and innovative in ideating, generating and screening multitude of potential business ideas with Development of Individual Marketing Strategies 5Ps (Mini Market, Bazaar, Match Box Heroes)	2,4	3	Class Project, Exams
CLO5	Explain the fundamentals of creative ideas being implemented through innovation to create a likely successful new venture(S)	1,2	2	Test, Exams
CLO6	Design and analyze the performance of the Funnel Model to screen many business ideas into very few manageable ones to choose from eventually	2,4	5	, Test, Exams
CLO7	Understand the operation of further processing of fewer ideas via critical thinking, SWOT analysis and Business plan to pick a business venture,	1,2	2	Test, Exams
CLO8	Apply the practical understanding of knowing the Strengths, Weaknesses, Opportunities and Threats (SWOT Analysis) as strategic planning tool in business and other life endeavors as demonstrated in the Class	2,3	4	Quiz, Exams
CLO9	Evaluate the design of a Business Model Canvas (BMC) from a chosen business related to the students' course of studies	2,4,11	5	Test, Exams
CLO10	Explain from the basis of the Business Model Canvas (BMC) the Business Plan of the Business to attract sponsors, loaners and Bank supports/Grants.	1,3	3	Assignment, Exams
CLO11	Discuss and analyze the relationship and differences between BMC and Business Plan	2,3,4	4	Assignment, Exams
CLO12	Understand the parameters, points, quantities and calculations breaking even in Business	1.2	2	Test, Exams
CLO13	Utilize methods of market surveys and financial books to sustain Business	1,5	3	Test, Exams

Grading Standard

- Assignments: 10%
- Project: 10%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE 524 (3 Units; Core; L = 45) C**ourse Title:** Advanced CAD/CAM

Contact Hour: 3 Hours per week **Pre-requisite:** Nil

Contact Time/Venue: Fri, 8 – 11am, R213 **Semester:** Second

Lecturer in-charge: Engr. Prof. I. C. Ugwuoke

Course Overview

The concept of CAD and CAM is relatively new. The usage is linked with the development of computers. The actual application of CAD/CAM in industry, academia and government is only approximately 50 years old. Formal courses in CAD and Finite Element Analysis (FEA) were introduced in 1970's. The major application thrust of CAD came in 1980's with the availability of PCs and workstations. In its early stage of usage, very few engineering companies could afford the expense of mainframe computers. CAD/CAM has a wider scope of applications which includes: Aerospace, Automotive, Chemical & Process, Communications, Computers & IT, Electrical & Electronics, Medical & Pharmaceutical, Military & Defence, Rail & Marine, Structural & Civil, Apparel and Textile Industries.

Course Contents

Computer Aided Design (CAD) the Design process creating the Manufacturing Data Base, Benefits of Computer-Aided Design. Hardware in CAD. Numerical Control, conventional numerical control NC part Programming, computer controls in NC Computer. Integrated Production Management Systems. Shop Floor Control and Computer Process Monitoring, Transformations.

Recommended Texts

1. Mikell P. Groover and Emory W. Zimmers, CAD/CAM: Computer Aided Design and Manufacturing, Prentice-Hall, 1984.
2. Anupam Saxena & Birendra Sahay, Computer Aided Engineering Design, Co-published by Springer, 233 Spring Street, New York 10013, USA with Anamaya Publishers, New Delhi, India, 2005
3. Peter Smid, CNC Programming Handbook, Third Edition, Industrial Press, Inc., 2007.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Understand CAD/CAM Definitions	1,2	2	Test, Exams
CLO2	Understand CAD Evaluation Criteria: Hardware & Software Evaluation Criteria	2,3	4	Test, Exams
CLO3	Understand the Mechanical Engineering Applications of CAD/CAM	1,2,3	5	Test, Exams
CLO4	Understand the Benefits of CAD/CAM Implementation.	2,4	3	Test, Exams
CLO5	Understand the Functions Performed by CAD/CAM	1,2	2	Test, Exams
CLO6	Understand the Important Processes Involved in CAD/CAM Integration	2,4	5	Test, Exams
CLO7	Understand Concurrent Engineering Concept: Art-to-Part Concept.	1,2	2	Test, Exams
CLO8	Understand Computerized Numerical Control (CNC) Programming which also includes Basic Information Needed by a CNC Machine.	2,3	4	Test, Exams
CLO9	Understand the Letter Codes associated with CNC Programming and their Applications to Part Programming.	2,4,11	5	Project, Exams
CLO10	Understand the Three Major Phases of a CNC Program: Program Setup; Material Removal; System Shutdown	1,3	3	Assignment, Exams
CLO11	Understand Geometric Models: Wireframe, Surface, and Solid.	2,3,4	4	Assignment, Exams
CLO12	Understand Basic Transformations: Translation, Scaling, and Rotation about the Origin with Examples.	2,3	4	Assignment, Exams
CLO13	Understand Transformations about Arbitrary Points and Axes with Examples	1,5	3	Assignment, Exams

Grading Standard

- Assignments: 10%
- Project: 10%
- Test: 20%
- Semester Examination: 60%

Course: MEE 527 **Course Title:** Laboratory Practical V

Course Unit (s): Three (3) **Time:** 3 Hours Contact Time Per Week

Semester: SECOND **Location:** Mechanical Engineering Lab.

Pre – requisites: N/A Status: Compulsory

Instructor (s): Engr. Dr. A.B. Garba, Engr, Dr, O.A. Osayi, Engr. A. Lifi, Engr. Aliyu & Engr, Prof. N.A Musa

Course Overview and Description

The course is essentially a laboratory practical work involving laboratory practical and experiments in order to familiarizes students with various skills knowledge involved in the practical works. This includes but not limited to; carrying out vehicle evaluation using parameters to value vehicle worthiness, Tyre maintenance and types of Tyre shapes problem, Folding and fabrication, Gas welding process and how to use different flames, Heat transfer process. The course is aimed at impacting skills knowledge for students' growth, productiveness and exposure.

Outlines of Course

A laboratory course work which involves laboratory practical skills works in the following courses; Vehicle Evaluation, Tyres maintenance, Folding work, Gas welding process and Heat transfer.

RECOMMENDED TEXTS

Halderman, J.D (2017) Automotive Engines. Theory and Servicing. 9th Edition, Pearson Automotive Series.

Elliot, K.G (2022) The Practical Book of Welding: Tips and method of welding, for beginners & expert guide. Independent publisher.

Vehicle Evaluation Module - Niger State Ministry of Works.

Course Learning Outcomes:

CLO	Learning Outcomes: Upon successful completion of the course students will be able to:	POs	Bloom Taxonomy Level	Assessment Tools
1.	Have a good knowledge of how to value a vehicle worth before auction, To have knowledge of different types of Tyre shapes problem and tyre maintenance To have knowledge of Folding and fabrication of galvanized steel Parker To have knowledge of Gas welding flames and uses.	1	1	Practical and report writing from Practical performed

CLO	Learning Outcomes: Upon successful completion of the course students will be able to:	POs	Bloom Taxonomy Level	Assessment Tools
2.	Understand the Principles of steps by step on how to carry out vehicle evaluation, Folding and fabrication process, Gas welding process and Heat transfer process.	1,3	2	Practical and report writing from Practical Practical and report writing from Practical
3.	Classify the different types of gas welding flames, to classify those vehicles that are in good serviceable condition and those vehicles that are scrapped.	5	4	Practical and report writing from Practical
4.	Knowledge on the functions of Gas welding Neural flame, carburizing flames and oxidizing flames. Knowledge on how to fabricate galvanized steel Parker Knowledge on heat transfer process Knowledge on how to evaluate a vehicle	2	3	Practical and report writing from Practical
5.	Understand the basic concept of Gas welding practice, heat transfer, different types of tyre shape problem, vehicle evaluation procedure and Folding work process.	1,3	2	Practical and report writing from Practical

GRADING STANDARD:

Practical and report writing from experiment(s). (100%)

Course Code: MEE 573 (3 Units; Core; L = 45) C**ourse Title:** Heat and Mass Transfer

Contact Hour: 3 Hours per week **Pre-requisite:** Nil

Contact Time/Venue: Fri, 8 – 11am, R213 **Semester:** Second

Lecturer in-charge: Engr. Prof. A. Nasir & Engr. J. Y. Jiya

Course Overview

Heat and Mass Transfer is a critical subject in Engineering, focusing on the principles and applications of heat transfer modes (conduction, convection, and radiation) and mass transfer. This course provides final-year students with an in-depth understanding of steady and transient heat conduction and convection in one-dimensional and two-dimensional situations, as well as the complexities of laminar and turbulent flows. Students will explore boiling and condensation phenomena, numerical computational methods for solving heat and mass transfer problems, radiation, and the design and analysis of heat exchangers, boilers, and typical industrial power plants.

Course Contents

Steady and transient heat conduction and convection in one dimensional and two-dimensional situations; Laminar and turbulent flow; Boiling and condensation; Numerical computational method of solving heat and mass transfer problems; Radiation; Heat exchangers; Boilers and typical industrial power plant

Recommended Texts

1. Çengel, Y.A. Heat and Mass Transfer: **Fundamentals and Applications**. McGraw-Hill Education, 2020.
2. Incropera, F.P., & DeWitt, D.P. **Fundamentals of Heat and Mass Transfer**. Wiley, 2011.
3. Bejan, A. **Convection Heat Transfer**. Wiley, 2013.
4. Rajput E R **Heat and Mass Transfer**. S Chand & Company Ltd. 2012

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Outcomes (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Explain the principles of steady and transient heat conduction in one and two-dimensional situations	1,	2	Test, Exams
CLO2	Analyze laminar and turbulent flows and their impacts on heat transfer	2	4	Test, Exams
CLO3	Evaluate the mechanisms of boiling and condensation and their industrial applications.	3	5	Test, Exams
CLO4	Apply numerical computational methods to solve complex heat and mass transfer problems	1	3	Test, Exams
CLO5	Formulate the fundamentals equations for radiation heat transfer and solve radiative heat exchange problems.	1	2	Test, Exams
CLO6	Design and analyze the performance of various types of heat exchangers	2,3	5	Project Test, Exams
CLO7	Identify the operation and types of boilers used in industrial power plants	2	2	Assignment, Exams
CLO8	Apply heat transfer principles to analyze a typical industrial power plant.	2,3	4	Assignment, Exams

Grading Standard

- Assignments: 10%
- Project: 10%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE 592 (2 Units; Elective; L = 30) C**ourse Title:** Fatigue and Fracture Mechanics

Contact Hour: 2 Hours per week **Pre-requisite:** Nil

Contact Time/Venue: Thur. 2 – 4pm, R213 **Semester:** Second

Lecturers in-charge: Engr. Dr. O. Adedipe

Course Overview

Fatigue-and-fracture mechanics is a critical subject in Engineering that deals with failure modes in engineering components and structures due to the nature of loads they experience in service. This course provides final year students with useful knowledge through the application of subjects such as engineering mechanics, mathematics, strength of materials; and theory of machines for the design, operation and maintenance of engineering structures that experience fatigue loads in service. Fatigue and fracture mechanics provide useful information to students and graduate engineers with respect to design concepts, stress analyses, failure modes, design methods and state of art engineering technologies that are needed to determine the lifecycle of Engineering infrastructure.

Course Contents

Solid structure; strength; Shear and cleavage defects in solids; Phenomenon of Elastic crack and Griffith Theory; Fracture toughness and stress intensity factor; Crack initiation, propagation and growth; Fracture of solids, brittle and ductile fracture, modes of crack deformation; Fatigue of metals: Stress cycle forms; Fatigue tests and presentations; Influential factors of fatigue: mean stress, geometrical factors and environmental effects.

Recommended Texts

1. Anderson, T. L. Fracture Mechanics: Fundamentals and Applications. 4th Edition. CRC Press, 2017.
2. Barson, J. M. Fracture and Fatigue Control in Structures. 3rd Edition. Butterworth-Heinemann, 1999.
3. Piascik, R. S. and Reuter, W. G. Fatigue and Fracture Mechanics. 33rd Edition. ASTM International, 2002.
4. Schijve. J. Fatigue of Structures and Materials. 2nd Edition. Springer, 2009.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Explain the principles of fatigue phenomenon in structural systems	1,2	2	Test, Exams
CLO2	Describe the concept of environmental effect in crack initiation, propagation and failure	2,3	4	Test, Exams
CLO3	Describe the types of fatigue cycles and the corresponding loading regimes	1,2,3	5	Test, Exams
CLO4	Explain different types of fatigue waveforms and their influences in behaviour of structures	2,4	3	Test, Exams
CLO5	Explain various factors influencing the fatigue lives of dynamically loaded structures	1,2	2	Test, Exams
CLO6	Understand the concept of elastic crack and Griffith theory in cracked infinite plates	2,4	5	Assignment, Test, Exams
CLO7	Explain the fundamentals of brittle and ductile fracture mechanisms	1,2	2	Test, Exams
CLO8	Understand crack initiation, propagation and growth	2,3	4	Test, Exams
CLO9	Evaluate the lifecycle of representative test specimens using fatigue damage curves	2,4,11	5	Project, Exams
CLO10	Describe the interaction of stress concentration, stress intensity and fracture toughness in fatigue life estimation	1,3	3	Assignment, Exams
CLO11	Explain the basic principles of linear elastic fracture mechanics	2,3,4	4	Assignment, Exams
CLO12	Discuss the roles of mean and residual stresses in fatigue crack growth	2,3	4	Assignment, Exams
CLO13	Apply the knowledge fatigue crack behaviour to schedule maintenance strategies in practical engineering structures	1,5	3	Assignment, Exams

Grading Standard

- Assignments: 10%
- Project: 10%
- Test: 20%
- Semester Examination: 60%

Course Code: MEE 542 (2 Units; Elective; L = 30) C**ourse Title:** Machine Tools

Contact Unit(s)our: 2 Hours per week **Pre-requisite:** EET 221

Contact Venue: Wednesday, 11-1pm, Rm213 **Semester:** Second

Lecturer in-charge: Engr. Dr. A. A. Abdullahi

Course Overview:

Machine Tools is an elective course run in the department under Industrial and Production Engineering options. It focuses on learning of Machines such as Lathe, Drilling, Milling, Shaping, Planning and Slotting. It is expected that the students will learn how to operate these machines and how to carryout various machining operations. Furthermore, design analysis Gear-box design of

Outline of the Course:

Machine tool principles and applications; Production tooling and methods; Elements of machine tools; Kinematics of machine tools; Jig and tool design; Grinding, marching of gears and threads; Construction of machine tools; Drilling and milling.

Recommended Textbooks:

Chattopadhyay, A. B. (2011). *Machining and Machine Tools*, Wiley-India.

Joshi, P. H. (2007). *Machine Tools Handbook-Design and operations*, Tata McGraw-Hill, New Delhi, India.

Mehta, N. K. (2012). *Machine Tool Design and Numerical Control*, 3rd Edition, Tata McGraw-Hill, New Delhi, India.

Sharma, P. C. (2009). *A Textbook of Production Engineering*, 5th Edition, S. Chand, New Delhi, India.

Course Learning Outcomes:

CLO	**Course Learning Outcome**: Upon successful completion of the course, student will be able to:	POs	Bloom's Taxonomy Level	Assessment Tools
CLO1	Understand Machine Tools principles.	1	2,5	Quiz, Homework, Test, Exams.
CLO2	Identify various operations and parts of Machine Tools commonly available in typical machine shop.	4,9	1,2	Quiz, Test, Exams.
CLO3	Understand production tooling and methods.	1	2	Quiz, Test, Exams.

CLO	**Course Learning Outcome**: Upon successful completion of the course, student will be able to:	POs	Bloom's Taxonomy Level	Assessment Tools
CLO4	Identify elements of Machine Tools.	2	1,2	Quiz, Homework, Test, Exams.
CLO5	Analyse kinematics of Machine Tools	2,3	3,4	Quiz, Homework, Test, Exams.
CLO6	Design and Fabrication of Machine Tools.	3	6	Quiz, Homework, Exams.

Grading Standard:

Homework and Quizzes: 20%

Mid-Semester Examination (Test): 20%

Semester Examination (Exams): 60%

Course Code: MEE 533 (2 Units; Elective; L = 30)

C**ourse Title:** Production Planning and Control

Contact Hour: 2 Hours per week **Pre-requisite:** Nil

Contact Time/Venue: Wed. 11 – 1pm, Rm 213 **Semester:** Second

Lecturers in-charge: Engr. Prof. K. C. Bala

Course Overview

Production Planning is a course which is mainly concerned with production facilities and how the facilities should be laid down in the space available for production; how they should be used to produce the desired products at the desired rate. Production planning is dynamic in nature and always remains in fluid state as plans may have to be changed according to the changes in circumstances. The course will provide final year students with knowledge and mechanism to monitor the execution of the plans. One of the significant functions of the course is to ensure that production operations are started at planned places and planned times. Observing progress of the operations and recording it properly. Analyzing the recorded data with the plans and measuring the deviations. Taking immediate corrective actions to minimize the negative impact of deviations from the plans. Feeding back the recorded information to the planning section in order to improve future plans.

Course Contents

Production economics. Nature and significance of production costs. Objectives of cost analysis and cost control. Standard and marginal costing. Allocating of overheads. Overhead absorption. Break-even analysis. Variance analysis. Budgetary control. Profit planning and profitability analysis. Project cost control analysis. Manufacturing activities. Utilization of resources for production including people. Company structure. Production organization. Plant layouts, Inventory control. Short- and long-range planning. Decision tree analysis.

Recommended Texts

1. Kiran, D. R. Production Planning and Control: A Comprehensive Approach. Butterworth – Heinemann, 2019.
2. Landy, T. M. Production Planning and Control. McGraw Hill, 1950
3. Chapman, N.S. Fundamentals of Production Planning and Control. Pearson, 2005.

4. Bewoor, A. K. Production Planning and Control. Satya Prakashan, 2016.

Course Learning Outcomes

Upon successful completion of the course, students will be able to

CLO	Description	Program Objectives (POs)	Bloom's Taxonomy Level	Assessment Tools
CLO1	Identify the problems and opportunities faced by the operations manager in manufacturing and service organizations	1,2	2	Test, Exams
CLO2	Develop an ability to apply production planning and control concepts in a various area like marketing, accounting, finance, engineering, personnel management, logistics;	2,3	4	Test, Exams
CLO3	Describe various operating cost components and business strategies for operations Management	1,2,3	5	Test, Exams
CLO4	Develop and analyze operations performance measurements and analysis for continuous improvement	2,4	3	Test, Exams
CLO5	Explain the Integration of operations concepts with other functional areas of business	1,2	2	Test, Exams
CLO6	Develop and analyze production and inventory planning/control systems,	2,4	5	Assignment, Test, Exams
CLO7	Explain the scheduling of engineering techniques usable for a complete production facility	1,2	2	Test, Exams
CLO8	Explain the concepts of requirements planning, inventory planning, capacity planning, and production planning and control systems	2,3	4	Test, Exams
CLO9	Describe the effect of product, process, inventory costs, product forecasting, operations strategies, and schedule design parameters on design of materials	2,4,11	5	Project, Exams
CLO10	Apply and analyze forecasting models to develop business enterprise forecasts for product demand, profits, sales, material requirements, capacity requirements	1,3	3	Assignment, Exams
CLO11	Identify the impact of production/inventory cost	2,3,4	4	Assignment, Exams
CLO12	Describe decisions and operations strategies on the break-even, return on investment and profit analysis of a business enterprise	2,3	4	Assignment, Exams
CLO13	Design line balancing for various aspects of the manufacturing and service industry	1,5	3	Assignment, Exams

Grading Standard

- Assignments: 10%
- Project: 10%
- Test: 20%
- Semester Examination: 60%

Course Title: Automobile Maintenance and Testing.

Course Code: MEE 583 (2 Units, L = 28)

Contact Hour: 2 hours

Contact Venue: Friday, 11:00 - 1:00 pm, Room 213, **Semester:** Second

Lecturer in – charge: Engr. Dr. Muhammadu Masin Muhammadu

Course Overview:

Automobile Maintenance and testing provide the students opportunities and exposes them to various systems of an automobile and classifications of main parts or components automobiles. Give description and function operation and maintenance in transmission, suspension, steering, cooling, lubrication and electrical systems. Distinguish between diesel engines, state principles of operation and phasing calibration of pump. Offering this course aautomobile maintenance and testing would enable a graduate of the programme to have the opportunities and necessary skill to contribute towards the attainment of goals 1, 3, 4 and 10 (Agenda 2063) and goals 4, 8 and 11 (SDG 2030). These are some of the areas that can provide quality of education, standard of living, transformation of economics, world-class infrastructure and self-empowerment. The objectives of the course, learning outcomes, and contents are made to address this need.

Course contents

Various systems of an automobile: main parts /components automobiles. Description, function of operation and maintenance: transmission, suspension, steering, cooling, lubrication and electrical systems.

Introduction to diesel engines: principles of operation, and phasing calibration of pump

Recommended Texts

Automotive Technology: A systems approach, 7th Edition, Jack Erjarec and Rob Thompson.

Automotive Technology: A systems approach, 7th Edition, Ubuy.

Automobile Engine: Theory and serving by Helderman.

Automobile Mechanical and Electrical systems, 2nd Edition by Ubuy.

Automotive product development – A systems engineering Implementation by Vivec O. Bhise.

Course Learning Outcomes

CLO	**Course Outcome**: Upon successful completion of the course, student will be able to	POs	Blooms Taxonomy	Assessment Tools
CLO1	Identify and classify various systems of an automobiles.	1, 3	3	Assignment, exams
CLO2	Distinguish different parts or component of an automobile.	2, 3	4	Assignment, exams
CLO3	Describe and explain functions of transmission, suspension, steering, cooling, lubrication and electrical systems in an automobile.	2, 4	3	Assignment, exams
CLO4	Distinguish between spark ignition and compression ignition engines.	2, 4	4	Assignment, exams
CLO5	Describe the principles of operation spark ignition and compression ignition engines.	1, 3	3	Assignment, exams
CLO6	How to calibrate injection pumps of spark ignition and compression ignition engines	2,4	2	Assignment, exams

Grading Standard

Assignments: 20%

Continuous Assessment: 20%

Semester Examination: 60%