KWARA STATE UNIVERSITY, MALETE

The Green University for Community Development and Entrepreneurship

Faculty of Engineering, Department of Mechanical Engineering

Undergraduate Admission Requirements

Admission Requirements
The Department had substantially complied with minimum admission requirements as stipulated by NUC/COREN. This is in respect of the minimum score at UTME and O' level subject combinations in Mathematics, Physics, Chemistry and English.

Admission requirements for the Mechanical Engineering degree Programme

REQUIREMENTS		**UTME SUBJECTS**	**SPECIAL CONSIDERATION (WAIVER)/ REMARKS**
DIRECT ENTRY	**UTME**		
In addition to O'Level and post-UTME requirements, candidates must have either of the following: (i) A'Level IJMB or approved equivalent, Pass in Mathematics (Pure / Applied), Physics, and Chemistry with a minimum of 10 points. (ii) OND (Upper Credit) in Mechanical Engineering with at least one-year post-diploma experience.	UTME candidates are required to obtain O'Level credits in five (5) subjects, including English Language, Mathematics, Physics, Chemistry, and any other relevant subject.	English Language, Mathematics, Physics and Chemistry.	**UTME:** Candidates who passed Further Mathematics and Technical Drawing at Credit levels stand at an advantage.

Other conditions to note

(i) A credit pass in English Language and Mathematics of the IJMB at the O' Level is acceptable as equivalent to SSCE/GCE O' Level for admission purposes.

Course Structure & Curriculum

The course structure and curriculum for undergraduate students in the Department of Mechanical Engineering are provided here.

100 Level Harmattan Semester

S/No	Course code	Course title	Credits	LH	TH	PH	Total per week
1.	CHM131	General Physical Chemistry	3	3	45		3
2.	CHM151	Practical Chemistry I	1	1	15	45	3
3.	MTH101	Elementary Mathematics (Math I)	3	3	45		3
4.	MTH103	Elementary Diff. and Integral Cal.	3	3	45		3
5.	STA101	Introduction to Probability	2	2	30		2
6.	PHY101	General Physics (Physics I)	4	4	60		4
7.	PHY103	Experimental Physics I	1	1	15	45	3
8.	GNS101	Use of English I	2	2	30		2
	Total per semester		**19**		**285**	**90**	**23**

100 Level Rain Semester

S/No	Course Code	Course Title	Credits	LH	TH	PH	Total/week
1.	CHM112	General Inorganic Chemistry	3	3	45		3
2.	CHM122	General Organic Chemistry	2	2	30		2
3.	CHM152	Practical Chemistry II	1			45	3
4.	MTH102	Elementary Mathematics II	3	3	45		3
5.	MTH104	Elementary Algebra and Trig.	3	3	45		3
6.	PHY104	Experimental Physics II.	1		15		1
7.	PHY102	General Physics II	4	4	60		4
8.	STA102	Intro. to Probability Distribution	2	2	30		2
9.	GNS102	Use of English II	2	2	30		2
10.	GNS108	Use of Library	2	2	30		2
	Total per semester		**23**	**21**	**330**		**27**

200 Level Harmattan Semester

S/No	Course Code	Course Title	Credits	LH	TH	PH	Total per week
1.	GET 201	Applied Electricity I	3	3	45		3
2.	GET 215	Engineering Graphics I	2	2	30		2
3.	GET 233	Engineering Technology	2	2	30	2	4
4.	GET 241	Fundamentals. of Fluid Mechanics	3	3	45		3
5.	GET251	Engineering Mechanics I	2	2	30		3
6.	GET261	Computer Programming I	1	1	15		3
7.	GET 263	Engineering Mathematics I	3	3	45		3
8.	GET 283	General Engineering and Technology Lab. Course I	2			6	6
9.	VTE 203	Enterprise Creation and Development	0		1		1
	Total per semester		**18**		241	8	**27**

200 Level Rain Semester

S/No	Course Code	Course Title	Credits	LH	TH	PH	Total per week
1.	GET 202	Applied Electricity II	3	3	45		3
2.	GET 216	Engineering Graphics II	2	2	30		4
3.	GET 242	Fundamentals of Thermodynamics	3	3	45		3
4.	GET 252	Engineering Mechanics II	2	2	30		3
5.	GET 262	Computer Programming II	2	2	30		2
6.	GET 264	Engineering Mathematics II	3	3	45		3
7.	GET 272	Engineering Materials	2	2	30		2
8.	GET 284	General Engineering Lab. Course II	2			6	6
9.	GNS 206	Introduction to Entrepreneurship	2	2	30		2
10.	VTE 204	Innovation and Product Development	0	1	15		0
	Total per semester		**21**		300	6	**28**

300 Level Harmattan Semester

S/No	Course Code	Course Title	Credits	LH	TH	PH	Total/week
1.	ECE361	Electrical Machines I	3	3	45		3
2.	GET361	Engineering Mathematics III	3	3	45		3
3.	GET 373	Engineer in Society	1	1	15		1
4.	GNS307	Politics and Inter-Governmental Relations	1	1	15		1
5.	MEE 325	Engineering Design I	3	3	45		3
6.	MEE337	Engineering Metallurgy	3	3	45		3
7.	MEE 353	Applied Thermodynamics I	2	2	30		2
8.	MEE 355	Fluid Dynamics I	2	2	30		2
9.	MEE 361	Metrology	2	2	30		2
10.	MEE 381	Mechanical Engineering Lab. I	2			6	6
11.	VTE303	Entrepreneurship Mentorship	0	2	30		2
	Total per semester		**22**		330		**28**

300 Level Rain Semester

S/No	Course Code	Course Title	Credits	LH	TH	PH	Total per week
1.	ECE 342	Applied Computers Programming	2	2	30		2
2.	GET 302	Engineering Economics	3	3	45		3
3.	GET362	Engineering Mathematics IV	3	3	45		3
4.	GET376	Engineering Communications	1	1	15		1
5.	MEE 302	Theory of Machines	3	3	45		3
6.	MEE 326	Machine Drawing	2	2	30		2
7.	MEE 346	Manufacturing Processes	2	3	45		3
8.	MEE 362	Engineering Experimentation	2	2	30		2
9.	MEE 382	Mechanical Engineering Lab. II	2			6	6
10	VTE304	Enterprise Resource Planning	0	2	30		2
	Total per semester		**20**	**21**	**315**		**27**

400 Level Harmattan Semester

S/No.	Course Code	Course Title	Credits	LH	TH	PH	Total per week
1.	CEE 363	Strength of Materials	2	2	30		2
2.	CEE 485	Civil Engineering Practice	2	2	30		2
3.	ECE 441	Control Engineering I	3	3	45		3
4.	GET463	Engineering Statistics	2	2	30		2
5.	MEE 421	Engineering Design II	3	3	45		3
6.	MEE425	Mechanics of Machines	3	3	45		3
7.	MEE 435	Applied Thermodynamics II	2	2	30		2
8.	MEE 443	Fluid Dynamics II	2	2	30		2
9.	MEE 465	Automobile WorkshopPractice	2	2	30		2
10.	MEE 493	Mechanical Engineering Lab Course III	3			9	9
11.	VTE401	Entrepreneurship Practice	0	2	30		2
	Total per semester		**24**	**23**	**345**	**9**	**33**

400 Level Rain Semester

S/No	Course Code	Course Title	Credits	LH	TH	PH	Total Per week
1.	GET 222	SWEP	3			18	18
2.	MEE 392	Industrial Training I	3			18	18
3.	MEE 492	Industrial Training II	6			36	36
	Total per semester		**12**			**72**	**72**

500 Level Harmattan Semester: Common Courses

S/No	Course Code	Course Title	Credits	LH	TH	PH	Total Per week
1.	GET 501	Engineering Management	2	3	30		2
2.	MEE505	Computer Aided Design/ Manufacturing (CAD/CAM)	3	3	45		3
3.	MEE 523	Thermal Engines	3	3	45		3
4.	MEE 591	Project I	3			9	9
	Total per semester		**11**		**120**	**9**	**17**

500 Level Harmattan Semester: Production Option							
S/No	**Course Code**	**Course Title**	**Credits**	**LH**	**TH**	**PH**	**Total Per week**
1.	MEE 531	Industrial Engineering	3	3	45		3
2.	MEE 533	Maintenance Engineering	3	3	45		3
	Total per semester		**6**		**90**		**6**

500 Level Harmattan Semester: Thermo-fluid Option							
S/No	**Course Code**	**Course Title**	**Credits**	**LH**	**TH**	**PH**	**Total Per week**
1.	MEE 543	Fluid Dynamics III	3	3	45		3
2.	MEE 561	Heat and Mass Transfer	3	3	45		3
	Total per semester		**6**		**90**		**6**

500 Level Rain Semester

S/No	**Course Code**	**Course Title**	**Credits**	**LH**	**TH**	**PH**	**Total Per week**
1.	GET502	Engineering Law	2	2	30		3
2.	MEE 504	Technology Policy	2	2	30		2
3.	MEE 522	Refrigeration & Air Conditioning	3	3	45		3
4.	MEE 572	Tribology	2	2	30		2
5.	MEE 592	Project II	3			9	9
	Total per semester		**12**		**135**		**18**

500 Level Rain Semester: Production Option							
S/No	**Course Code**	**Course Title**	**Credits**	**LH**	**TH**	**PH**	**Total Per week**
1.	MEE 532	Operation Research	3	3	45		3
2.	MEE 534	Systems Analysis	3	3	45		3
	Total per semester		**6**		**90**		**6**

500 Level Rain Semester: Thermo-fluid Option							
S/No	**Course Code**	**Course Title**	**Credits**	**LH**	**TH**	**PH**	**Total Per week**
1.	MEE 506	Turbomachinery	3	3	45		3
2.	MEE 524	Auto- systems & Vehicledynamics	3	3	45		3
	Total per semester		**6**		**90**		**6**

Course Contents (CCMAS/BMAS)

CHM101 General Chemistry I

2 Credits

Atoms, molecules, elements and compounds, and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. 640 Hybridisation and shapes of simple molecules. Valence forces; Structure of solids. Chemical equations and stoichiometry; chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.
30h (L); C

CHM107 General Practical Chemistry I
2 Credits
Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.
45h (P); C

GET101 Engineer in Society
1 Credits
History, evolution and philosophy of science. engineering and technology. The engineering profession – engineering family (engineers, technologists, technicians and craftsmen), professional bodies and societies. Engineers' code of conduct and ethics, and engineering literacy. Sustainable development goals (SDGs), innovation, infrastructures and nation building - economy, politics, business. Safety and risk analysis in engineering practice. Engineering competency skills – curriculum overview, technical, soft and digital skills. Guest seminars and invited lectures from different engineering professional associations.
15h (L); C

GST 111 Communication in English

2 Credits

Sounds and sound patterns in English Language (vowels and consonants, phonetics and phonology); English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations); major word formation processes; the sentence in English (types: structural and functional); grammar and usage (tense, concord and modality). Reading and types of reading, comprehension skills, 3RsQ. Logical and critical thinking; reasoning methods (logic and syllogism, inductive and deductive argument, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities (pre-writing (brainstorming and outlining), writing (paragraphing, punctuation and expression), post- writing (editing and proofreading). Types of writing (summary, essays, letter, curriculum vitae, report writing, note-making). etc. Mechanics of writing. Information and Communication Technology in modern language learning. Language skills for effective communication. The art of public speaking.

15h (L), 45h (P); C

CHM102 General Chemistry II

2 Credits

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

30h (L); C

GST112 Nigerian Peoples and Culture

2 Credits

Nigerian history, culture and art up to 1800 (Yoruba, Hausa and Igbo peoples and cultures; peoples and cultures of the minority ethnic groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914; formation of political parties in Nigeria; nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian Civil War). Concepts of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigerian peoples; trade, skill acquisition and self-reliance).

Social justice and national development (definition and classification of law); Judiciary and fundamental rights. Individuals, norms and values (basic Nigerian norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage and development; negative attitudes and conducts [Cultism, kidnapping and other related social vices]). Re-orientation, moral and national values (The 3Rs – Reconstruction, Rehabilitation and Re-orientation; re-orientation strategies: Operation Feed the Nation (OFN), Green Revolution, Austerity Measures, War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.
30h (L); C

MTH 101 Elementary Mathematics I (Algebra and Trigonometry)
2 Credits
Elementary set theory, subsets, union, intersection, complements, Venn diagrams. Real numbers, integers, rational and irrational numbers. Mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem, complex numbers, algebra of complex numbers, the argand diagram. De-Moiré's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.
30h (L); C

MTH 102 Elementary Mathematics II (Calculus) 2 Credits
Functions of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation, maxima and minima. Extreme curve sketching, integration, definite integrals, reduction formulae, application to areas, volumes (including approximate integration: Trapezium and Simpson's rule).
30h (L); C

CHM 108 General Practical Chemistry II
1 Credits
Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.
45h (PH); C,

MTH 103 Elementary Mathematics III (Vectors, Geometry and Dynamics)
2 Credits
Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, scalar, multiplication of vectors, linear independence. Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two-dimensional co-ordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normal. Kinematics of a particle. Components of velocity and acceleration of a particle moving in a plane.

Force, momentum, laws of motion under gravity, projectiles and resisted vertical motion. Elastic string and simple pendulum. Impulse, impact of two smooth spheres and a sphere on a smooth surface.
30h (T); C, PR: MTH 101

PHY 101 General Physics I (Mechanics)
2 Credits
Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton's laws of motion (inertial frames, impulse, force and action at a distance, momentum conservation); relative motion; application of Newtonian mechanics; equations of motion; conservation principles in physics, conservative forces, conservation of linear momentum, kinetic energy and work, potential energy, system of particles, centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; circular motion; moments of inertia, gyroscopes and precession; gravitation: Newton's law of gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits.
30h (L)

PHY 102 General Physics II (Behaviour of Matter)
2 Credits
Heat and temperature, temperature scales; gas laws; general gas equation; thermal conductivity; first Law of thermodynamics; heat, work and internal energy, reversibility; thermodynamic processes; adiabatic, isothermal, isobaric; second law of thermodynamics; heat engines and entropy, Zero's law of thermodynamics; kinetic theory of gases; molecular collisions and mean free path; elasticity; Hooke's law, Young's shear and bulk moduli; hydrostatics; pressure, buoyancy, Archimedes' principles; Bernoullis equation and incompressible fluid flow; surface tension; adhesion, cohesion, viscosity, capillarity, drops and bubbles.
30h (T), C

PHY 107 General Practical Physics I
1 Credit
This introductory course emphasizes quantitative measurements. Experimental techniques. The treatment of measurement errors. Graphical analysis. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc. (covered in PHY 101, 102, 103 and PHY 104). However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.
45h (P), C

PHY 108 General Practical Physics II

1 Credit

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements, the treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

45h (P); C

MEE 101 Introduction to Mechanical Engineering

1 Credit

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

15h (L); C

GST 212 Philosophy, Logic and Human Existence

2 Credits

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

30h (T); C

ENT 211 Entrepreneurship and Innovation

2 Credits

The concept of entrepreneurship (entrepreneurship, intrapreneurship/corporate entrepreneurship); theories, rationale and relevance of entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship, and creative destruction); characteristics of entrepreneurs (opportunity seeker, risk-taker, natural and nurtured, problem solver and change agent, innovator and creative thinker); entrepreneurial thinking (critical thinking, reflective thinking and creative thinking). Innovation (The concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation).

Enterprise formation, partnership and networking (basics of business plan, forms of business ownership, business registration and alliance formation, and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office and networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.
30h (L); C

GET 201 Applied Electricity I
3 Credits
Fundamental concepts: Electric fields, charges, magnetic fields. current, B-H curves Kirchhoff's laws, superposition. Thevenin, Norton theorems, Reciprocity, RL, RC, RLC circuits. DC, AC bridges, Resistance, Capacitance, Inductance measurement, Transducers, Single phase circuits, Complex j - notation, AC circuits, impedance, admittance, susceptance.
45h (L); C

GET 202 Engineering Materials
3 Credits
Basic material science; atomic structure, atomic bonding and crystal structures. Engineering materials situating metals and alloys; metals and alloys, classifications of metals, metal extraction processes using iron and steel (ferrous) and aluminium (nonferrous) as examples, phase diagrams/iron carbon diagrams, and mechanical workings of metals. Selection and applications of metals and alloys for specific applications in oil, aerospace, construction, manufacturing and transportation industries, among others. Ceramics (including glass); definition, properties, structure and classifications of ceramics. Bioactive and glass – ceramics. Toughing mechanism for ceramics. Polymers; definition of polymers as engineering materials, chemistry of polymeric materials, polymer crystallisation, polymer degradation and aging. Thermoplastic and thermosetting polymers and concepts of copolymers and homopolymers. Composites; definition, classification, characterisation, properties and composite. Applications of composites. Nanomaterials; definition, classification and applications of nanomaterials as emerging technology. Processing of nanomaterials including mechanical grinding, wet chemical synthesis, gas phase synthesis, sputtered plasma processing, microwave plasma processing and laser ablation. Integrity assessment of engineering materials; effect of engineering design, engineering materials processing, selection, manufacturing and assembling on the performance and service life of engineering materials. Metallography and fractography of materials. Mechanical testing (destructive testing) of materials such as compressive test, tensile test, hardness test, impact test, endurance limit and fatigue test. Non-destructive test (NDT) such as dye penetrant, x-ray and eddy current.
45h (L); C

GET 204 Students Workshop Practice

2 Credits

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

15h (L); 45h (P), C

GET 205 Fundamentals of Fluid Mechanic

3 Credits

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

45h (L); C

GET 206 Fundamentals of Engineering Thermodynamics

3 Credits

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

45h (L); C

GET 207 Applied Mechanics

3 Credits

Introduction to ordinary differential equations (ODEs); theory, applications, methods of solution; second order differential equations. Advanced topics in calculus (vectors and vector-valued function, line integral, multiple integral and their applications). Elementary complex analysis including functions of complex variables, limits and continuity. Derivatives, differentiation rules and differentiation of integrals. Cauchy-Riemann equation, harmonic functions, basic theory of conformal mapping, transformation and mapping and its applications to engineering problems. Special functions.

45h (L); C

GET 208 Strength of Materials

3 Credits

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

45h (L); C

GET 209 Engineering Mathematics I

3 Credits

Limits, continuity, differentiation, introduction to linear first order differential equations, partial and total derivatives, composite functions, matrices and determinants, vector algebra, vector calculus, directional derivatives.

45h (L); C

GET 210 Engineering Mathematics II

3 Credits

Introduction to ordinary differential equations (ODEs); theory, applications, methods of solution; second order differential equations. Advanced topics in calculus (vectors and vector-valued function, line integral, multiple integral and their applications). Elementary complex analysis including functions of complex variables, limits and continuity. Derivatives, differentiation rules and differentiation of integrals. Cauchy-Riemann equation, harmonic functions, basic theory of conformal mapping, transformation and mapping and its applications to engineering problems. Special functions.

45h (L); C

GET 211 Computing and Software Engineering
3 Credits
Introduction to computers and computing; computer organisation – data processing, memory, registers and addressing schemes; Boolean algebra; floating-point arithmetic; representation of non-numeric information; problem-solving and algorithm development; coding (solution design using flowcharts and pseudo codes). Data models and data structures; computer software and operating system; computer operators and operators' precedence; components of computer programs; introduction to object oriented, structured and visual programming; use of MATLAB in engineering applications. ICT fundamentals, Internet of Things (IoT). Elements of software engineering.
30h (L); 45h (P); C

GET 299 Students Industrial Work Experience I
3 Credits
Practical experience in a workshop or industrial production facility, construction site or special centres in the university environment, considered suitable for relevant practical/industrial working experience but not necessarily limited to the student's major. The students are exposed to hands-on activities on workshop safety and ethics, maintenance of tools, equipment and machines, welding, fabrication and foundry equipment, production of simple devices; electrical circuits, wiring and installation. (8-10 weeks during the long vacation following 200 level).
9 wk (P); C

GET 309* Engineering Economics
3 Credits
The nature and scope of engineering economics. Basics concepts of engineering economy. Interest formulae. Simple interest and compound interest. Effective rate of interest. Nominal interest rate. Time value of money. Discounted cash flow calculations. Loan principal and interest payment. Gradient equivalence. Comparison of alternatives. Present worth analysis. Annual cost analysis. Benefit cost analysis. Break even analysis. Equivalent annual growth. Rate of return. Minimum acceptable rate of return. Judging attractiveness of proposed investments.
45h (L); C

GST 312 Peace and Conflict Resolution
3 Credits
The concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, economic, geo-political Conflicts; structural conflict theory, realist theory of conflict, frustration-aggression conflict theory; root causes of conflict and violence in Africa: indigene and settlers phenomenon, boundaries/boarder disputes, political disputes, ethnic disputes and rivalries, economic inequalities, social disputes, nationalist movements and agitations; selected conflict case studies – Tiv-Junkun, ZangoKartaf, chieftaincy and land disputes, etc. Peace building, management of conflicts and security: Peace & Human Development.

Approaches to Peace & Conflict Management (religious, government community leaders, etc.). Elements of peace studies and conflict resolution: Conflict dynamics assessment Scales: Constructive & Destructive. Justice and Legal framework: Concepts of Social Justice; The Nigeria Legal System. Insurgency and terrorism. Peace mediation and peace keeping. Peace and Security Council (international, national and local levels). Agents of conflict resolution – Conventions, Treaties Community Policing: Evolution and Imperatives. Alternative Dispute Resolution (ADR) (dialogue, arbitration, negotiation, collaboration, etc). The roles of international organizations in conflict resolution ((a) The United Nations, UN and its conflict resolution organs. (b) The African Union & Peace Security Council (c) ECOWAS in peace keeping). The media and traditional institutions in peace building. Managing postconflict situations/crises: Refugees. Internally Displaced Persons (IDPs); the role of NGOs in post-conflict situations/crises.
45h (L); C

ENT 312 Venture Creation
3 Credits
Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro-finance, personal savings, small business investment organizations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, First Mover Advantage, E-commerce business models and successful e-commerce companies). Small business management/family business: Leadership & Management, basic book keeping, nature of family business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (The concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - artificial intelligence (AI), virtual/mixed reality (VR), Internet of things (IoTs), blockchain, cloud computing, renewable energy, etc. Digital business and e-commerce strategies).
45h (L); C

GET 301 Engineering Mathematics III
3 Credits
Linear Algebra. Tensor algebra and analysis, Elements of Matrices, Determinants, Inverses of Matrices, bases representation of tensors. The Euclidean point space and vector spaces.

Theory of Linear Equations. Eigen Values and Eigen Vectors. Analytical Geometry. Basic transformations: identity, spherical, Projection and Coordinate Transformation as tensors, Traces, Determinants and other scalar invariants. Equivalent stresses and strains as examples of scalar invariant. Applications to design, analyses and optimization. Eigenvalues, Eigenvectors of tensors. Solid Geometry. Polar, cylindrical and spherical coordinates. Elements of functions of several variables. Surface Variables. Ordinary Integrals. Evaluation of Double Integrals, Triple Integrals, Line Integrals and Surface Integrals. Derivation and Integrals of Vectors. The gradient of scalar and files. Flux of Vectors. The curl of a vector field, Gauss, Greens and Stoke's theorems and applications: Determinations and applications to field equations in linear abd nonlinear mechanics. Singular Valued Functions. Multivalued Functions. Analytical Functions. Cauchy Riemann's Equations. Singularities and Zeroes. Contour Integration including the use of Cauchy's Integral Theorems. Bilinear transformation.
45h (L); C

GET 302 Engineering Mathematics IV
1 Credit
Series solution of second order linear differential equations with variable coefficients. Bessel and Legendre equations. Equations with variable coefficients. Sturn-Louville boundary value problems. Solutions of equations in two and three dimensions by separation of variables. Eigen value problems. Use of operations in the solution of partial differential equations and Linear integral equations. Integral transforms and their inverse including Fourier, Laplace, Mellin and Handel Transforms. Convolution integrals and Hilbert Transforms. Calculus of finite differences. Interpolation formulae. Finite difference equations. RungeKutta and other methods in the solutions of ODE and PDEs. Numerical integration and differentiation.
15h (L); C

GET 304 Technical Writing and Communication
3 Credits
A brief review of common pitfalls in writing. Principles of clear writing (punctuations and capitalization). Figures of speech. Units of grammar. Tenses and verb agreement. Active and passive sentences Lexis and structure Fog Index concept. Skills for communication and communication algorithm. Types and goals of communication; Interpersonal communication; features and the Finger Model or A,B,C,D,E of good interpersonal communication (accuracy of technical terms, brevity of expression, clarity of purpose, directness of focus and effectiveness of the report). Language and organisation of reports. Technical report writing skills(steps, problems in writing, distinguishing technical and other reports, significance, format and styles of writing technical reports). Different formats for communication; styles of correspondences – business report and proposal, business letter, memorandum, e-mails, etc. Proposals for projects and research; format, major steps and tips of grant-oriented proposals.

Research reports(competency, major steps, components and formats of research reports and publishable communication). Sources and handling of data, tables, figures, equations and references in a report. Presentation skills; overview, tips, organisation, use of visual aids and practising of presentation. Intellectual property rights in research reports. Case studies of major engineering designs, proposals and industrial failures with professional presentation of reports.
45h (L); C

GET 305 Engineering Statistics and Data Analytics
2 Credits
Descriptive statistics, frequency distribution, populations and sample, central tendency, variance data sampling, mean, median, mode, mean deviation, percentiles, etc. Probability. Binomial, poison hyper-geometric, normal distributions, etc. Statistical inference intervals, test hypothesis and significance. Regression and correlation. Introduction to big data analytics and cloud computing applications. Introduction to the R language; R as a calculator; Vectors, matrices, factors, data frames and other R collections. Iteration and looping control structures. Conditionals and other controls. Designing, using and extending functions. The Apply Family. Statistical modelling and inference in R.
30h (L); C

GET 307 Introduction to Artificial Intelligence, Machine Learning and Convergent Technologies 2 Credits
Concepts of human and artificial intelligence; artificial/computational intelligence paradigms; search, logic and learning algorithms. Machine learning and nature-inspired algorithms – examples, their variants and applications to solving engineering problems; understanding natural languages; knowledge representation, knowledge elicitation, mathematical and logic foundations of AI; expert systems, automated reasoning and pattern recognition; distributed systems; data and information security; intelligent web technologies; convergent technologies – definition, significance and engineering applications. Neural networks and deep learning. Introduction to python AI libraries.
30h (L); C

GET 399 Students Industrial Work Experience Scheme II
4 Credits
On-the-job experience in industry chosen for practical working experience but not necessarily limited to the student's major (Students are to proceed on three months of work experience i.e. 12 weeks during the long vacation following 300 level). Students are engaged in the more advanced workshops, indoor software design training similar to what they will use in the industry and outdoor construction activities to sharpen their skills. The use of relevant animation videos that mimic industrial scenarios is encouraged. Students are to write a report at the end of the training. As much as possible, students should be assisted and encouraged to secure 3 months placement in the industry.

Examples of outline of activities and experiences to which students are expected to be exposed to earn prescribed credits include: Section A: Welding and fabrication processes, automobile repairs, · lathe machine operations: machining and turning of simple machine elements, such as screw threads, bolts, gears, etc. Simple milling machine operations, machine tool maintenance and troubleshooting, andwooden furniture making processes. Section B: Mechanical design with computer graphics and CAD modelling and drafting. Introduction to Solidworks: software capabilities, design methodologies and applications. Basics part modelling: sketching with SolidWorks, building 3D components, using extruded Bose base · Basic assembly modelling, and solidWorks drawing drafting. Top-down assembly technique exploded view, exploded line sketch. Introduction to PDMS 3D design software; autoCAD mechanical, SPSS. A comprehensive case study design project. The student should be introduced to the concept of product/component design and innovation and then be given a comprehensive design project. Examples of projects should include the following: a. design of machine components; b. product design and innovation; c. part modelling and drafting in solidworks; and d. technical report writing.

12 weeks; C

Departmental (MEE) COURSES DESCRIPTION

MEE 301 Computer-Aided Design and Manufacture

3 Credits

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

30h (L); 45h (P)

MEE 308 Engineering Design I

2 Credits

Introduction to mechanical engineering design. Decisions in engineering design. Materials strength and stiffness, Material strength and cold working. Load and stress analysis. Mohr's circles for plane stress. Torsion-bending stress in straight and curve beams, Applications of torsion-bending to design problems. Concept of stress concentration in design. Stresses in pressurised cylinder. Stress in rotating rings. Deflection and stiffness. Deflection of beams due to bending. Deflection of beam by singularity method. Castigliano's theorem. Deflection of curved beams. Design of compression members. Failure and Design for Failures due to static and cyclic loadings. Failure theories. Application of failure in design. Endurance limit and modification. Fatigue strength and fluctuating stress.

30h (L); C

MEE 310* Manufacturing Processes

2 Credits

Concept of manufacturing and application. Classification of manufacturing processes and selection. Application of manufacturing processes, Effect of manufacturing processes on properties of metals. Metal casting process. Patterns allowance and moulding types. Types of casting. Casting defects and prevention. Metal forming techniques. Sheet metal operations. Metal joining process and application. Weldability of metals and application. Machining operation and its application in manufacturing. Mechanisms of metal cutting. Chip formation and power consumption. Heat generation and cutting tool materials. Fundamentals of powder metallurgy.

30h (L); C

MEE 312* Instrumentation and Control

2 Credits

Process measurement. Pressure and level flow. Temperature, humidity, density and viscosity. Primary element calibration. Signals nozzles. Baffle and relay balancing principles. Transmitters. Controller and valve actions and mechanism. Control responses. On-off, proportional. Automatic, reset, pre-act, 3-ter, and gap control. Automatic controllers and inter-linked instruments. Concept of control loops. Ratio, Cascade, and split range. Override and point time cycle. Forward feed controllers. Instrument error and recognition faults.

30h (L); C

MEE 425 Mechanics of Machine

3 Credits

Free and forced vibrations of lump mass-spring systems with and without damping, whirling of shafts, critical speed, vibration isolation and transmissibility, two-degree of freedom system, dynamic absorbers, continuous systems, balancing of rotors.

45h (L), C

ECE 441 Control Engineering I

3 Credits

Introduction to control systems - feedback concept and advantages, system classification, structures. Control systems components – mechanical, electronic, hydraulic, thermal, position control, servomechanism and regulators. Mathematical modeling of control systems, System transfer functions, signal flow graphs, block diagram reduction, stability, Routh-Hurwitz criteria. Transient and steady state analysis of control systems. Compensation techniques. Series/parallel feedback Controllers. State space modeling and analysis of control systems.

45h (L), C

MEE 443 Fluid Dynamics II

2 Credits

Thermodynamic and dynamic principles applied to fluid behaviour, stream function and velocity potential, ideal, viscous and compressible fluids under internal and external flow conditions. Inviscid flow. Vorticity and rotation of fluid particles. Introductory concepts of boundary layer and re-circulating flows, Mathematical derivation of Navier-stokes equations and its application.

30h (L), C, PR : MEE 355

CEE 363 Strength of Materials

2 Credits

Generalized stress-strain relationship, Biaxial and triaxial state of stress. Stress transformation. Mohr's circle, failure theories. Theories of bending of beams. Unsymmetrical bending and shear centre. Strain energy application. Torsion of non-circular and thin-walled hollow members. Advanced topics in bending moment and shear force in beams. Deflection of beams. Biaxial and triaxial state of stress. Transformation of stresses. Springs, creep, fatigue, fracture and stress concentration.

30h (L); E

MEE 465 Automobile Workshop Practice

2 Credits

Introduction to workshop and Safety precautions. Introduction to the principles of operation of engines and transmission system. Description and functions of the main components of a vehicle. General servicing of the automobile. Wheel balancing and alignment; Routine maintenance; Fault finding techniques and rectification procedures; Test and Performance analysis of auto parts and systems.

30h (L), C

MEE 493 Mechanical Engineering Laboratory Course III
3 Credits
Laboratory investigations and report submission for selected experiments in Mechanics of machines, Engineering Experimentation, Applied Thermodynamics and heat transfer, Applied Fluid Mechanics and Mechanical Behaviour of Materials.
15h (L), 90h (P); C

MEE 504 Technology Policy
2 Credits
An overview of the National Technology Policy, Acquisition, adaptation and application of scientific and technological knowledge for other national development objectives. National strategy, patents and inventions; trademarks and copy-right, contract documents, professional responsibilities and liabilities.
30h (L); C

MEE 505 Computer Aided Design/Manufacturing (CAD/CAM)
3 Credits

Students will be introduced to the fundamentals of Computer Numerical Controlled (CNC) Machines and their programming. This course will cover the basic operation of CNC machines with topics such as safety, simulation, tooling with tool selection, and machine zeroing. Students will also be introduced to Computer Aided Manufacturing (CAM). CN Machine Topics will include machine speeds and feeds, feed rate and cycle time optimization. Students will also be introduced to CAT/CAM with topics to include part geometry, CAM-Mill processes, contouring, cycle time estimation.

30h (L); 45h (P); C

MEE 506 Turbomachinery
3 Credits
Introduction to Turbomachinery, Characteristic curve for axial-flow and centrifugal pumps, fans, blowers, impulse and reaction turbine, fluid couplings, similarity Laws, pelton wheel, reaction turbine, hydraulic transmission, Torque converter, Hydraulic accumulators and application to cranes, hydraulic intensifiers
.
45h (T); E

MEE 543 Fluid Dynamics III
3 Credits
Characteristics and performance of internal combustion engines. Piston engines of the Otto and diesel types, gas turbines. Thermodynamics of cycles, combustion, fuel metering, injection, supercharging and compounded engines.
45h (L), E

MEE 512 Advanced Strength of Materials

3 Credits

Review of concepts in solid mechanics; stress, strain, momentum balance, energy principles, linear and non-linear stress-strain laws. Plane stress and strains in cylinders. Small deflections of plates, classical approximate and strain energy methods. Computer applications, cylindrical shells. Analysis of stress and strain; Torsion theory. Introduction to plasticity, slip line theory and plastic stress-strain laws. Fracture mechanics.

45h (L), E

MEE 514 Vibration

2 Credits

Free and forced oscillation for lumped mass-spring system with and without damping. Detailed study of one degree of freedom system in Mechanical vibration. Multi-degree of freedom system by impedance methods. Selected topics including rigid body vibration on elastic coils. Perturbation methods of non-linear vibration problems. Vibration of machinery; free and forced vibration. Natural frequencies, damping and critical speeds; Transverse vibration of beams. Whirling of shafts, torsional vibrations. Practical classes; A T16 vibration bridge needed for a minimum of five practical.

30h (L), E

MEE 522 Refrigeration and Air Conditioning

3 Credits

Refrigeration Cycles: Revision of single stage vapour compression systems. Analysis of absorption refrigerators. Refrigeration and Air-Conditioning Applications: Domestic, commercial, industrial, marine and transportation applications of both refrigeration and air-conditioning. Properties of Refrigerants: Toxicity, inflammability, chemical activity, odour and oil solvent properties, Thermodynamic characteristics. Compressors: Reciprocating and rotary types. Hermetically sealed compressors. Lubrication. Fans. Heat Exchangers: Condensers and evaporators. Water and brine spray chambers. Evaporative condensers. Cooling coils and air washers. Refrigeration Load: Convected heat. Product load. Infiltration and ventilation effects. Radiation effects. The Psychometry of Air-Conditioning Processes: Revision of dehumidification and humidification. Water injection. Steady injection. Mixing and adiabatic saturation with reheat. Comfort and inside design conditions: The metabolic rate. Bodily mechanisms of heat transfer. Environmental influences on comfort. Environmental refreshness.

45h (L), C

MEE 523 Thermal Engine
3 Credits
Review of thermodynamics. Introduction to combustion engine with emphasis on application of thermodynamics and fluid dynamics. Analysis of cycles. Performance characteristics of gas and steam turbines. Internal combustion engines (I.C.E) propulsion systems; compressors and combustion units. Exhaust emissions.
30h (T), 45h (P); C

MEE 524 Auto System and Vehicle Dynamics
3 Credits
Introduction to the basic mechanics governing vehicle performance, analytical methods, and terminology. Tire and Rim Fundamentals, Forward Vehicle Dynamics, Tire Dynamics, Driveline Dynamics, Vehicle Mechanisms, Steering Dynamics, Suspension Mechanisms, Vehicle Planar Dynamics, Vehicle Roll Dynamics, Applied Vibrations, Vehicle vibrations.
45h (L), E

MEE 531 Industrial Engineering
3 Credits
Work study, payment systems and performance levels including job evaluation, production control, Gantt Charts and manual scheduling, labour and organization critical path analysis and resources allocation, inventory control.
30h (T), 45h (P); C

MEE 532 Operation Research
3 Credits
Formation and Optimization for mathematical models. Techniques of operations research such as mathematical programming, queuing theory. Inventory models, replacement techniques applied to production control and inventory. Calculus of variation, maximum principles, dynamic programming, optimization and optimum seeking methods. Method of regression analysis and statistical testing. Transportation and assignment problems, non-linear programming models critical path analysis, PERT. Practical problems of data collection and problem formulation.
45h (L); E

MEE 533 Maintenance Engineering
3 Credits
Preventive maintenance. Predictive Maintenance (PM). Total productive maintenance (TPM). Facilities maintenance and facilities management. Equipment maintenance and safety engineering. Plant engineering and facilities operations. CPE review and Physical plant management.
45h (L); E

MEE 534 System Analysis

3 Credits

Concepts, methodology, methods and tools for discovery, definition, analysis, design, creation, and sustainment of systems involving information, physical, and human elements; Principles and application of techniques in analysis of decision processes involving engineering systems under uncertainty. The systems perspective of a computer integrated manufacturing system; manufacturing and its various levels and the planning and control of product movement through the production system in the context of using real time control, multiprocessor systems, network architectures and databases.

45h (L), E

MEE 561 Heat and Mass Transfer

3 Credits

Heat and Mass by Conduction: The general conduction equation. Steady one-dimensional conduction with and without generation. Steady quasi one-dimensional conduction. Steady two-dimensional conduction. Numerical solution of two-dimensional conduction equation. One-dimensional transient conduction. Heat Transfer by Convection: Forced convection-consideration of thermal boundary layer. Forced convection-Reynolds analogy and dimensional analysis. Natural convection. Separated flow convection. Convection with phase change. Mass transfer by convection. Processes of diffusion. Mass transfer in laminar and turbulent convection. Combined heat and mass transfer.

45h (L), E

MEE 572 Tribology

2 Credits

Principles of friction, lubrication and wear. Viscosity, dry and boundary friction. Surface studies, topography and quality. Hydrostatic, hydrodynamic and air lubrication, lubricants and materials for tribological applications.

30h; (L), C

MEE 574 Fracture Mechanics and Fracture Analysis

3 Credits

Types of fracture and fractography. Structure of solids, shear and cleavage defects in solids, Crack initiation and propagation, stress intensity factor, Griffith, Orowan's and Irwin's theories, stress concentration and the design consideration in machine elements. Role of microstructure in various kinds of failure. Environmental effects and time-dependent failures. Fatigue and creep failure.

45h (L), E

MEE 591 Project I

3 Credits

The senior project is a year independent study intended for students who choose to work in teams of two or more. Work begins in the harmattan semester, but enrolment is only in rain semester when a double grade is awarded. Groups develop

their own topic or select a topic from a list of topics prepared by the department. Groups develop a work plan and select an advisor for their work. A second reader is assigned by the instructor. A written progress report is expected at the end of the harmattan semester. Groups submit a written final report and make an oral presentation to faculty, staff, fellow students and guest at the end of the rain semester.

90h (P), C

MEE 592 Project II

3 Credits

Similar to MEE 591 with the principles difference that the team or group project must incorporate aspects and principles of design, whether for a system, product, vehicle, device, software, or apparatus. The year-long senior project with design may be used to satisfy a portion of the department's design requirement.

90h (P), C

Note: PR - Pre-requisite; h(P) – Practical Hours; h(L) – Lecture hours for the Theory; R - Required; E - Elective; C - Compulsory