BELLS UNIVERSITY OF TECHNOLOGY

OTA OGUN STATE

CURRICULUM

COURSE OUTLINE AND COURSE CONTENT

for

DEGREE PROGRAMME: **BIOMEDICAL ENGINEERING B.Eng (Hons)**

PROGRAMME DURATION: **5 years**

DEPARTMENT: **MECHANICAL & BIOMEDICAL ENGINEERING**

COLLEGE: **ENGINEERING**

MARCH 2017

DEPARTMENT OF MECHANICAL & BIOMEDICAL ENGINEERING

Philosophy (B. Eng (Hons) BIOMEDICAL ENGINEERING)

The philosophy of the department is to combine the principles and practices of science and modern technology to produce graduates who can design and produce functional products to meet the needs of society. The scope of training will include design and manufacture, repair and maintenance for the BIOMEDICAL industrial sectors. The department aims to achieve this by optimizing the use of existing teaching and research resources in the science and engineering departments of the university and through collaboration with the large number of industries and medical health facilities that are located in the vicinity of the university.

1. Objectives

1. To train and produce men and women who will be alert to the Biomedical Engineering needs of their immediate society and who will venture into modern application of traditional engineering principles.

2. To train and produce graduates who are equipped with relevant knowledge and skills for identifying, analysing and solving problems in the production of machines and components for mechanical systems using the appropriate technology.

3. To produce graduates who are self-confident and equipped with entrepreneurial skills to set up businesses and to become employers of labour.

2. **Programme Structure:**

Bachelor of Engineering in Biomedical Engineering is a 5 – year Programme. Students will go for Students Works Experience Programme (SWEP) for a period of 12 weeks each at the end of the 200Level and 300Level respectively, and six months Students Industrial Work Experience Scheme for the whole of second semester 400Level. At 500Level, the students will carry out supervised independent project in their areas of interest. The University has secured affiliations with University of Lagos Teaching Hospital (LUTH), AWOJOBI Clinic, ERUWA, Faramed Hospitals, OTA and MediCARE Hospitals, OTA for Industrial Placements for experience to compliment the laboratories and workshops in the University.

3. GRADUATION REQUIREMENT *B.Eng.(Biomedical Engineering)*

i. Minimum Units required for graduation**: 150 Units for UTME entrants**.
ii. Minimum Units required for graduation**: 126 Units for Direct Entry entrants**
iii. Minimum Number of years required for graduation:
5 years for UTME admissions and 4 years for Direct Entry into 200Level
iv. Minimum CGPA required for graduation: **1.5**

REQUIRED UNITS TO GRADUATE B.ENG (BIOMEDICAL ENGINEERING)

Level	Core / Compulsory	Required	Electives	Industrial Training	TOTAL
100	29	19	0	0	**48**
200	26	15	0	0	**41**
300	25	14	0	0	**39**
400	13	9	0	6	**28**
500	20	10	8	0	**38**
TUO	**113**	**67**	**8**	**6**	**194**
TUP	**113**	**27**	**4**	**6**	**150**

LIST OF COURSES

100 LEVEL B.ENG (HONS) BIOMEDICAL ENGINEERING (1ST SEMESTER)

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
1ST SEMESTER	AMS 101	General Mathematics I	C	Nil	3	2	1	0
	AMS 103	Mathematics for Engineers I	R	Nil	2	2	0	0
	PHY 101	Basic Principles of Physics I	C	Nil	3	2	1	0
	PHY 103	Experimental Physics I	C	Nil	1	0	0	3
	CHM 101	General Chemistry I	C	Nil	3	2	1	0
	CHM 103	Practical Chemistry (Physical)	C	Nil	1	0	0	3
	BIO 101	Basic Principles of Botany	C	Nil	3	2	1	0
	BIO 103	Experimental Plant Biology	C	Nil	1	0	0	3
	MEE 101	Technical Drawing I	C	Nil	1	0	0	3
	CSC 101	Introduction to Computer Science	R	Nil	3	2	0	3
	GES 101	Use of English I	C	Nil	2	2	0	0
	GES 107	Use of Library	R	Nil	1	1	0	0
	TOTAL				24			

LIST OF COURSES

100 LEVEL B.ENG (HONS) BIOMEDICAL ENGINEERING (2ND SEMESTER)

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
2ND SEMESTER	AMS 102	General Mathematics II	C	Nil	3	2	1	0
	AMS 104	Mathematics for Engineers II	R	Nil	2	2	0	0
	PHY 102	Basic Principles of Physics II	C	Nil	3	2	1	0
	PHY 104	Experimental Physics II	R	Nil	1	0	0	3
	CHM 102	General Chemistry II	R	Nil	3	2	1	0
	CHM 104	Practical Chemistry (Organic/Inorganic)	R	Nil	1	0	0	3
	BIO 102	Principles of Animal Biology	R	Nil	3	2	1	0
	BIO 104	Experimental Animal Biology	R	Nil	1	0	0	3
	MEE104	Introduction to Simulation Packages	R	Nil	2	1	0	3
	CSC 102	Introduction to Computer Programming	C	Nil	3	2	0	3
	GES 104	Use of English II	C	Nil	2	2	0	0
	TOTAL				24			

LIST OF COURSES

200 LEVEL B.ENG (HONS) BIOMEDICAL ENGINEERING (1ST SEMESTER)

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
1ST SEMESTER	MEE 201	Engineering Drawing	C	MEE 101	2	1	0	3
	MEE 203	Materials Science	C	PHY 102	2	2	0	0
	MEE 205	Applied Mechanics	C	PHY 101	2	2	0	0
	MEE 207	Thermodynamics	C	PHY 101	2	2	0	0
	EEE 203	Applied Electricity I	C	PHY 102	3	2	1	0
	EEE 205	Engineer-In-Society	C	Nil	1	1	0	0
	EEE 207	Electrical Workshop Practice	R	PHY 102	1	0	0	3
	AMS 207	Engineering Mathematics I	C	AMS 102	3	2	1	0
	CSC 201	Computer Programming Methodology	R	CSC 102	3	2	1	0
	ECO 221	Economics for Non-Management Students	R	Nil	2	2	0	0
	TOTAL				21			

LIST OF COURSES

200 LEVEL B.ENG (HONS) BIOMEDICAL ENGINEERING (2ND SEMESTER)

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
2ND SEMESTER	MEE 202	Mechanical Workshop Practice	C	Nil	1	0	0	3
	MEE 204	AutoCAD	R	MEE 101	2	1	0	3
	MEE 206	Fluid Mechanics	C	Nil	2	2	0	0
	MEE 208	Strength of Materials I	C	Nil	2	2	0	0
	EEE 204	Applied Electricity II	C	Nil	3	2	1	0
	EEE 206	Electrical Measurement & Instrumentation	R	Nil	2	2	0	0
	AMS 210	Engineering Mathematics II	C	AMS 102	3	2	1	0
	CSC202	Object-Orientated Programming	R	CSC 102	3	2	0	3
	GES 202	Peace Studies & Conflict Resolution	R	Nil	2	2	0	0
		TOTAL			20			
	BME 220	Students Work Experience Program I (SWEP I)	C	Nil	0			

LIST OF COURSES

300 LEVEL B.ENG (HONS) BIOMEDICAL ENGINEERING (1ST SEMESTER)

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
1ST SEMESTER	BME 301	Introduction to Biomedical Engineering	C	Nil	2	2	0	0
	BME 303 / BTE 203	Introductory Cell & Molecular Biology	R	BIO 102	2	2	0	0
	BME 305	Human Anatomy	C	BIO 102	2	2	0	0
	BME 307	Biomaterials Science I	C	MEE 203	2	2	0	0
	BME 309	Biomedical Engineering Lab	C	Nil	2	0	0	6
	TCE 301	Signals & Systems Analysis	R	Nil	2	2	0	0
	EEE 301	Engineering Mathematics III	C	AMS 207	3	2	1	0
	EEE 305	Electronics Engineering I	R	Nil	2	2	0	0
	BUS 311	Introduction to Entrepreneurial Studies	R	Nil	2	2	0	0
	TOTAL				19			

LIST OF COURSES

300 LEVEL B.ENG (HONS) BIOMEDICAL ENGINEERING (2ND SEMESTER)

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
2ND SEMESTER	BME 302	Medical Biochemistry	R	Nil	2	2	0	0
	BME 306	Biomedical Engineering Workshop Practice	C	Nil	2	0	0	6
	BME 308	Biomedical Instrumentation	C	EEE 206	3	2	1	0
	BME 310	Biomaterials Science II	R	MEE 203	2	2	0	0
	BME 312	Human Physiology	C	BIO 102	2	2	0	0
	BME 314	Biomechanics I	C	MEE 205	2	2	0	0
	EEE 302	Engineering Mathematics IV	C	AMS 210	3	2	1	0
	EEE 308	Electronics Engineering II	R	Nil	2	2	0	0
	GES 302	Introduction to Philosophy	C	Nil	2	2	0	0
		TOTAL			20			
	BME 320	Students Work Experience Program II (SWEP II)	C		0			

LIST OF COURSES

400 LEVEL B.ENG (HONS) BIOMEDICAL ENGINEERING (1ST SEMESTER)

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
1ST SEMESTER	BME 401	Molecular Bioengineering	C	BME 303	2	2	0	0
	BME 403	Biomechanics II	R	BME 314	2	2	0	0
	BME 409	Introduction to Medical Imaging	C	Nil	2	2	0	0
	BME 411	Physiological Fluid Mechanics	C	MEE 206	3	2	1	0
	BME 413	Tissue Engineering & Regenerative Medicine	C	BME 303; BME 310	2	2	0	0
	MCT 401	Control Systems	R	Nil	3	2	1	0
	MEE 411	Research Methods in Engineering	R	Nil	2	0	0	0
	CVE 413	General Engineering Practice	C	NIL	2	2	0	0
	BUS 411	Entrepreneurial Skills Development Studies	C	Nil	2	2	0	0
	TOTAL				20			

LIST OF COURSES

400 LEVEL B.ENG (HONS) BIOMEDICAL ENGINEERING (2ND SEMESTER)

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
2ND SEMESTER	BME 402	Students Industrial Work Experience Schemes (SIWES)	C		6			
		TOTAL			6			

LIST OF COURSES

500 LEVEL B.ENG (HONS) BIOMEDICAL ENGINEERING (1ST SEMESTER)

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
1ST SEMESTER	BME 505	Biomedical Informatics	C	Nil	2	2	0	0
	BME 507	Prosthetics, Orthotics & Artificial Organs	C	Nil	3	2	1	0
	BME 509	Rehabilitation Engineering	C	Nil	3	2	1	
	MEE 505	Valuation of Engineering Systems	R	Nil	2	2	0	0
	MEE 523	Operations Research	R	Nil	2	2	0	0
	MEE 527	Engineering Management	R	Nil	2	2	0	0
		Electives	E	4				
	TOTAL				18			

NOTE: Students should choose a MINIMUM of 4 Units of Electives from the list below

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
1ST SEMESTER	BME 511	Bio-Transport Phenomenon	E	BME 411	2	2	0	0
	BME 513	Hospital Structures in Developing Economics	E	Nil	2	2	0	0
	BME 515	Principles of Rural Medical Practice	E	Nil	2	2	0	0
	MEE 501	Computer Applications in Engineering Designs	E	MEE 104; MEE 204	2	2	0	0

500 LEVEL B.ENG (HONS) BIOMEDICAL ENGINEERING (2ND SEMESTER)

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
2ND SEMESTER	BME 502	Clinical Engineering	C	BME 308	2	2	0	0
	BME 506	Applied Medical Imaging	C	BME 409	2	2	0	0
	BME 599	Research Project	C	Nil	6	-	-	-
	EEE 512	Engineering Law	R	Nil	2	2	0	0
	CVE 504	Tending and Estimating	C	BUS 411	2	2	0	0
	Electives			4	E			
	TOTAL				18			

NOTE: Students should choose a MINIMUM of 4 Units of Electives from the list below

	Course Code	Course Title	Status	Pre Requisite	Units	Contact Hours		
						Lecture	Tutorial	Practical
2ND SEMESTER	BME 514	Technology for Human Function	E	BME 308	2	2	0	0
	BME 518	Biomedical Telemetry	E	Nil	2	2	0	0
	BME 522/ HRM 302	Human Resources Management	E	Nil	3	3	0	0
	MEE 525	Subsea Pipeline Engineering	E	Nil	2	2	0	0
	BME 524 / MKT 202	Elements of Marketing	E	Nil	3	3	0	0

COURSE CONTENT

B.Eng (Hons) BIOMEDICAL ENGINEERING

100 LEVEL

MEE 101: TECHNICAL DRAWING 1 UNIT

Introduction to graphical representation using free hand drawing Materials and instruments in use for Technical drawing; different types of line and their uses: lettering borderlines, details-box and dimensioning on drawings. Paper sizes, drawing layout: Construction of points, lines, angles, triangles and polygons: Introduction to orthographic projections; Conic sections; ellipse, parabola and hyperbola; Loci including involutes, cycloid, epicycloids and hypocycloids, helixes

MEE 104: INTRODUCTION TO SIMULATION PACKAGES 2 UNITS

Introduction to Engineering tools for design and simulation. Such packages include Matcad, Matlab, LabVIEW, etc. for Computer Aided Design and Engineering. Introductory lectures will be given and simple practical examples will be as homework assignments to stimulate the students' interest in the use of these packages.

AMS 101: GENERAL MATHEMATICS I 3 UNITS

Elementary properties of integers. Mathematic induction. Set theory, relations and functions. Trigonometry-Solution of trigonometry equations.

Complex numbers-sum, difference, product and quotient of complex numbers, polar form, Argand diagram, locus problems, De Moire's theorem. Matrices-addiction, subtraction and multiplication, inverse matrix, determinants.

Statistical data: types and sources and method of data collection, presentation of data: tables, charts and graphs. Error and approximations, frequency and cumulative distributions. Measures of location, partition, Dispersion, skewness and Kurosis, Rates, Ratios and Index numbers.

AMS 102: GENERAL MATHEMATICS II 3 UNITS

Functions and graphs. An informal treatment of limits and continuity.

Inverse functions. Differentiation techniques including products, quotients, composites and parametric equations. Higher order derivatives. Equations of straight lines (including tangents and normal). Equation of a circle and ellipse.

Integration techniques. Probability Theory-Set theory and Venn diagrams, probability measures and axioms, mutually exclusive events, addition law, conditional probabilities, multiplication law, tree diagrams, Bayes theorems, independence.

Permutation and combinations. Probability distributions and expectations. Discrete and continuous random variables. Probability (density) functions and distribution functions.

AMS 103: MATHEMATICS FOR ENGINEERS I 2 UNITS

Vector Algebra - Addition and subtraction, components, scalar and vector products, differentiation of vectors. Applications.

Statics: Forces acting at a point, Parallel forces, Coplanar forces. Static Friction. Resolution of Forces. Distribution of force and Centre of gravity. Circular Forces. Bending moments and Shearing forces, Moments of Inertia.

Dynamics: Velocity, Acceleration, Linear, Relative and Parabolic Motions, Laws of Motion,

Resistant Forces: Air resistance, Terminal Velocity, Dynamic frictions, and Rolling Motions.

Power and Energy Equations, Simple Harmonic Motions, Motions in a Circle and Motions about a Fixed Axis

AMS 104: MATHEMATICS FOR ENGINEERS II 2 UNITS

Analysis of functions: Logarithmic functions, Trigonometric functions, Exponential functions, Hyperbolic functions, etc. Partial fractions. Integration techniques including substitution, integration by parts. Integration of functions: Logarithm and Exponential functions, Trigonometric and hyperbolic functions

Matrices, special matrices, matrix operations. Determinants and some useful theorems. Solution of system of linear equations by determinants. Linear dependence and independence rank of a matrix. General system of linear equations, existence and properties of solution,

Vector Space and Linear Mapping. Polynomial equations.

Series: Sequences, Infinite Series, Convergent and Divergent Series, Power Series, Taylor's Series, Maclaurin's Series, Binomial series

CSC 101: INTRODUCTION TO COMPUTER SCIENCE 3 UNITS

History of the computer, Introduction to computing system, hardware, software, auxiliary equipment and consumables. Trends in computing technology: centralized computing and distributed computing. Data, Information and Communications. Application of computer in business, science and engineering. Evaluation of computer awareness appreciation and utilization.

CSC 102: INTRODUCTION TO COMPUTER PROGRAMMING 3 UNITS

Identification of business, scientific and engineering problems. Formulation of alternative solutions to problems and their computer models. Overview of programming languages: History of programming languages; brief survey of programming paradigms. Study of the features of a common and popular programming language. Introducing to language translation: Comparison of interpreters and compilers. Study of at least one software package in the area of word processing, database processing, graphics/image processing and audio/video processing. Case study of some business, science and engineering problems.

PHY 101: BASIC PRINCIPLE OF PHYSICS I 3 UNITS

Rectilinear motion: Newton laws of motion. Impulse and linear momentum, conservation of linear momentum. Gravitation. Satellites and velocity. Work and Energy. Friction and viscosity. Orbital motion, moments and energy of rotation.

Simple harmonic motion of simple systems. Simple properties of solids, elasticity e.t.c. Surface tension and capillary effects. Temperature Scales.1st and 2nd laws of thermodynamics as applied to the properties of solids, liquid and gases e.g. calorimetry, expansion of liquids, gas properties, Third law and absolute zero of temperature. Thermal conductivity, types of radiation and energy spectrum of radiation.

PHY 103: EXPERIMENTAL PHYSICS I 1 UNIT

Experiments arising from the theory courses of Basic principle of physics I and illustrations of basic physical techniques for observation, measurement, data collection and analysis and deduction.

PHY 102: BASIC PRINCIPLES OF PHYSICS II 3 UNITS

Oscillation and waves: simple harmonic motion. Damped and forced oscillations.

Wave motion; stationary waves, principle of supposition.

Doppler Effect. Optics: basic characteristics of light; speed spectra. Reflection lenses. Dispersion and spectrometer. Optical instruments. Waves properties of light. Modern physics: the atomic structure and isotopes. Radioactivity cathode ray and x-ray tubes. Electromagnetism: Electric Charges: Electrostatic forces, fields and potentials, Coloumb's and Gauss's laws. Capacitance: dielectric materials, currents and resistance, direct current and circuits. The magnetic field; laws of magnetism, electromagnetism, inductance. Alternating current circuits, transients. Basic electronics, Magnetic properties of matter.

PHY 104: EXPERIMENTAL PHYSICS II 1 UNIT

Experiments arising from the theory courses of basics principles of physics II and illustration of basic physical techniques for observation, measurement, data collection, and analysis and deduction

CHM 101: INTRODUCTORY PHYSICAL CHEMISTRY 3 UNITS

Atoms, molecules and structures, bonding and intermolecular forces, kinetic theory of matter, elementary thermo chemistry. Rate of reaction, equilibrium, acids, bases and salts. Redox reactions and introduction to electrochemistry

CHM 102: INTRODUCTORY INORGANIC CHEMISTRY 3 UNITS

Electronic configuration, periodicity building up of periodic table. Hybridisation and shapes of simple molecules. Extraction of metals. Comparative chemistry of group IA IIA AND IVA elements. Introduction to transition metal chemistry and nuclear chemistry

CHM 103: PRACTICAL PHYSICAL CHEMISTRY 1 UNIT

Practical aspects of physical chemistry

CHM 104: PRACTICAL INORGANIC CHEMISTRY 1 UNIT

Practical aspects of inorganic chemistry

BIO 101: BASIC PRINCIPLES OF BOTANY 3 UNITS

Characteristics of living things. The cell theory. A typical cell plant. Plant form and function – plant classification, morphology, and physiology. Ecological principles – definition and role of plants in the environment, plant communities and interactions, Energy flow in the ecosystem and nutrient cycling. General characteristics, similarities, differences, distribution and economic importance of fungi, lower green and vascular plants; and viruses and bacteria.

BIO 102: PRINCIPLES OF ANIMAL BIOLOGY 3 UNITS

Animal cell: theory, form and function. General classification of animals and concept of evolution, characteristics and life histories of representative types in each phylum. Animals of medical, veterinary and economic importance. Reproduction in mammals – embryogenesis. The skin, sketelon and muscular systems. Kidney, homeostatic and excretion. Liver and functions. Transport system (blood and circulation). The nervous system. Animals and the environment.

BIO 103: EXPERIMENTAL PLANT BIOLOGY 1 UNIT

Practical components of BIO 101 which entail Microscopy, preparation and mounting of samples on microscope, slide preparation for various microorganisms and plants, including bryophytes and pteridophytes. Habitat recognition and properties of soils, plant types, seeds, flowering plants, characteristics and mode of reproduction.

BIO 104: EXPERIMENTAL ANIMAL BIOLOGY 1 UNIT

Practical components of BIO 102 including observation of the external and internal features of representative members of the different phyla. Dissection and identification of tissues, organs and systems of selected animals vertebrates and invertebrates. Preservation of animal's specimens.

GES 101: USE OF ENGLISH I 2 UNITS

Basic communicative skills for performing a variety of academic and social tasks through the medium of English. Focusing on speaking and listening as primary and natural skills that constitute an interactive process of constructing meaning that involves producing, receiving and processing information. Grammatical aspects of English language such as structure phenomenon involving morpheme, word, phrase, clause and sentence, area of parts of speech, tenses, concord, speeches and question tag; and mechanics of writing; descriptive, persuasive, narrative and expository.

GES 104: USE OF ENGLISH II 2 UNITS

The course emphasizes aspects of English language and communicative skills ranging from study skills through library skills, listening skills, comprehension and summary, register studies in English, to aspects of discourse analysis and mechanics of writing. Copious examples and illustrations which are indispensable to better understanding of intricacies of communicative English as an interaction medium are equally given much attention**.**

GES 107: USE OF LIBRARY 1 UNITS

Library Resources and Tools; Library and Society; Use of Library and Library Skills; E-Library; E-Learning Resources and Tools; Information Sources in Science and Technology; Management Sciences.

200 LEVEL

AMS 207: ENGINEERING MATHEMATICS I 3 UNITS

Functions, inverse trigonometric functions and principal values, hyperbolic & its inverse, graphs.

Concepts of continuity and differentiability. Mean-value theorem.

Taylor's series expansion. Integration by parts. Sequences: real numbers, monotone, convergence, limits. Infinite series: convergence tests, addition, multiplication. Power series, radius of convergence, integration, differentiation.

Real and imaginary parts, the complex plane, terminology and notation. Complex algebra, DeMoivre's theorem, powers and roots of complex numbers. Euler formula. Elementary functions of a complex variable, polynomials, and rational, exponential, trigonometric, hyperbolic, logarithmic, inverse trigonometric and inverse hyperbolic functions.

Vectors in R^n space, addition and scalar multiplication, linear combination of vectors, idea of linear dependence and independence. Dot and cross products, triple products, lines and planes.

Statistical Distribution Theory – Introduction to normal distribution. Introduction to the multinormal distribution of random variables – Bivariate transformation, Bivariate random variables. The Bivatriate normal distribution. Estimation Theory – Properties of estimator, bias, efficiency, sufficiency, consistency and invariance. Simple random sampling. Stratified random sampling. Multi-stage sampling. Determination of optimal sample size.

AMS 210: ENGINEERING MATHEMATICS II 3 UNITS

Partial Differentiation: Functions of several variables, continuity and partial derivatives. Total differentials, approximate calculations using differentials. Chain rule. Implicit differentiation. Series representation of functions, Taylor's Theorem. Extremum problems, without and with constraints, Lagrange multipliers, global extremum.

Ordinary Differential Equations: Definition, degree, order, linear, non-linear, solution. First order equations, separable variables, equations reducible to separable form, exact equations, integrating factors, linear equations. Linear differential equations with constant coefficients, homogeneous, non-homogeneous, complementary functions, particular integrals, D-operator method. General linear second-order differential equations (without using matrices).Power seri es solution, Legendre's differential equation.

EEE 203: APPLIED ELECTRICITY I 3 UNITS

Fundamental concepts – Electric charges and fields, current. Resistance, resistivity, temperature coefficients. Network laws and theorems: Ohm's Law, Nodal and Loop Analysis (Kirchoff's laws), Superposition theorem, Thevenin and Norton Theorems, Reciprocity, Muller's theorem, Maximum power transfer theorem, Delta and Star Configurations. Electrostatic charges and forces; Field intensities, potential, flux and flux density; Coulomb's Law, Capacitance, dielectrics, permittivity, energy storage. RL, RC, RLC circuits, DC and AC bridges, Complex J-notation, AC circuits, impedance, admittance, susceptance.

EEE 204: APPLIED ELECRICITY II 3 UNITS

Electrostatics: Charge and charge density. Coulomb's Law. Concept of fields. Electric flux density and electric field intensity. Gauss's theorem and applications. Voltage and electric potential. Conductor, dielectric, polarization, susceptibility, permittivity, Electrostatic boundary condition. Capacitance calculation and electric energy. **Magnetostatics:** Current and current density. Magnetic dipoles and current loops. Magnetic flux density and magnetic field intensity. Biot-Savart Law and Ampere's Law, Faraday's Law. Magnetostatic

boundary condition. Self and mutual induction. Inductance calculation and magnetic energy. **Magnetic Circuits:** B and H, Magnetic materials: diamagnetic material, paramagnetic material, ferromagnetic material. Saturation and Hysteresis, Hysteresis loss and eddy current loss, reluctance and permeance. Analysis of linear magnetic circuits (with air-gap problems), solenoids, chokes and magnetic circuits. **Basic machines** – DC, synchronous alternators, transformers, equivalent circuits. Single Phase and Three phase balanced circuits.
Electronics – Atom theory, Electron Emission, Thermonic Emission, Energy-band in semi-conductors, Electrons and holes in an intrinsic semiconductor, P and N doping, impurity level, Transport phenomena in semiconductor, Open-circuit P-N junction, diode currents, VI characteristics, Types of Diode. Application of diode; Rectifiers choke and capacitor filters, voltage regulation and inverters.

EEE 205: ENGINEER-IN-SOCIETY 1 UNIT

Principle, history and philosophy of Science and Engineering: concepts of development and the role of science and technology, inter-relationship of social ethics and values and science and technology. History of Engineering and Technology. Societal needs and resources in the genesis and development of science and technology. Social problems, impact assessment, and control of science and technology. Responsibilities of engineers. The Engineering profession. Engineers code of conducts and professional ethics. Motivation, control, responsibility, rewards and accountability of engineers and development of an ethical engineering professionalism. Engineering professional bodies and societies: the Council for the regulation of Engineering practices and Engineering Societies. Engineers and nation building – economy, politics, business, safety in Engineering. Cadres of engineering profession. Seminars, workshops, conferences and Annual General Meetings.

EEE 206: ELECTRICAL MEASUREMENT AND INSTRUMENTATION 2 UNITS

General Concepts Of Measurements: Variables and measurement signals, the three stages of generalized measurement system, some common terms used in the measurement system, mechanical loading, impedance matching, and frequency response. Factors considered in selection of instruments - Measurement accuracy and precision. Error analysis and classification, sources of error. Types of Instruments - Deflecting, Controlling and Damping forces in instruments Moving iron attraction chart and X-Y recorders. Low, medium and high resistance measurement - Kelvin double bridge - Medium resistance, Substitution method, Wheatstone bridge, Carey Foster slide wire bridge - High resistance, Price Gaurd Wire method, Loss of Charge Method - Measurement of inductance and capacitance: Maxwell, Hay, Anderson and Schering bridges. Ballistic Galvanometer, Principle of operation of flux meter, Grassort Fluxmeter - Testing of ring specimens - Determination of B-H curve by method of reversal and step by step methods - Testing of bar specimens, Bar and Yoke method, Hopkinson method, Permeameters - Iron loss measurement by Lloyd - Fisher Square. Transducers - classification - Principle of operation of Resistive potentiometer, LVDT, Strain Gauge and Piezo electric transducers - Measurement of Acceleration: Piezo electric accelerometer, LVDT accelerometer - Measurement of Pressure using capacitive transducers Measurement of Temperature: Resistance thermometer, thermistors and thermo couples. Introduction to digital instrumentation.

EEE 207: ELECTRICAL WORKSHOP PRACTICE 1 UNIT

Identify and draw electrical & electronics graphical symbols for: resistors, inductors, capacitors, diodes, transistors, thyristor, diac, triac, operational amplifier, logic gates, linear ICs, power switches, sockets, lamps, isolator switch, circuit breakers, machines, motors, generators, voltage and current sources, fans, ELCB, switch gear, fuses, relays, transformers, etc. Types of electrical cables and conductors. Earthing and Earthing systems. Wiring, types and methods of wiring. Design, read and interpret electrical installation drawings. Draw building wiring diagrams Single-phase and three-phase distribution and connections to domestic and industrial facilities, machines and equipment. Introduction to Computer Aided Electrical Designs – AUTOCAD (Electrical).

MEE 201: ENGINEERING DRAWING 2 UNITS

Engineering drawing techniques: Geometrical Constructions, Principles of Tangency. Orthographic Projections: Auxilliary views, Interpenetration & Development. Sectional Views and Dimensioning. Isometric Projection.

MEE 202: MECHANICAL WORKSHOP PRACTICE 1 UNIT

Introduction to basic equipment in wood, machine, fitting and welding workshops. Element of safety practice with the various tools used in the workshops. Discussion on general safety precautions. General principles governing the various workshop machines. Selection and use of tools for specific operations in the various workshops. Practical demonstration of use of tools and machines in performing basic workshop processes.

MEE 203: MATERIALS SCIENCE 2 UNITS

Fundamentals of structure, energetics, and bonding that underpin materials science. Topics include: an Introduction to thermodynamic functions and laws governing equilibrium properties, relating macroscopic behavior to atoms and molecules of materials; the role of electronic bonding in determining the energy, structure, and stability of materials; quantum mechanical descriptions of interacting electrons and atoms; materials phenomena, such as heat capacities, phase transformations, and multiphase equilibrium to chemical reactions and magnetism; symmetry properties of molecules and solids; structure of complex, disordered, and amorphous materials; tensors and constraints on physical properties imposed by symmetry; and determination of structure through diffraction. Real-world applications include engineered alloys, electronic and magnetic materials, ionic and network solids, polymers, and biomaterials.

MEE 204: AUTOCAD 2 UNITS

Introduction to CAD/CAM (emphasis on CAD), Uses, some of the softwares available. AutoCAD and its uses. Understanding the interface, selecting commands, getting online help, opening existing drawings, AutoCAD. Drawing basics:. Creating simple 2D objects .Creating freehand sketches. Creating more complex 2D objects such as Rectangles Polygons. Working with Coordinates: User Coordinate System (World, Absolute and Relative Coordinates), using Cartesian and Polar coordinates, 2-dimesional and 3-dimensional Coordinates. Modifying Objects: Select, Erase, Copy, Array, Scale, Break, Group, Join, Trim Chamfer, Fillet, Extend, Explode. Organizing and Documentation of drawing information: Layers, Linetypes, Lineweight, and Color Controls, Sheet Set Manager, Dimensioning. Getting drawing information: Specifying measurements and divisions, Calculating areas, distances and angles. Working with Blocks, Block Attributes and External References, AutoCAD Design Center. Plotting: Creating Layouts, Plotstyles, and Plotting of drawings. Drawing 3D objects: Drawing Pseudo-3D and true 3D objects, Editing 3D objects and solids, creating three-dimesional Images, Working with Raster Images and other Applications.

MEE 205: APPLIED MECHANICS 2 UNITS

Forces, moments, couples. Equilibrium of simple structures. First and second moments of area; centroids. Kinematics of rigid bodies in plane motion. Applications of Newton's laws of motion. Kinetic energy and momentum analysis. Hooke's law stresses and strains due to loading and temperature. The stress circle, deflection, deflection of beams. Shear forces and bending moments,. Design and analysis of telecommunication towers, standards, and regulations.

MEE 206: FLUID MECHANICS 2 UNITS

Properties of fluid. Fluid statics. Fluid motion/dynamics; Basic conservation laws of mass, momentum and energy. Friction effects and losses in laminar and turbulent flows in ducts and pipe. Flow between parallel

plates Dimensional analysis and dynamics similitude, principles of construction and operation of simple hydraulic machines. Hydropower systems.

MEE 207: THERMODYNAMICS 2 UNITS

Introductory survey of thermodynamics. What is Thermodynamics? Historical background, scope of thermodynamics, dimensions and units. Fundamental concepts: systems, control volume, properties and states, processes, heat and work, pressure, temperature and the zeroth law. Elementary form of the continuity equation. The first law of thermodynamics and its corollaries: conservation of energy, internal energy, enthalpy, thermodynamic properties of pure substances: P-V-T relations and diagrams, the ideal gas property tables and charts. The second law of thermodynamics and its corollaries: Reversibility, Irreversibility, Efficiency and thermodynamic temperature scale. Entropy. Clausius inequality, heat engines and heat pumps.

MEE 208: STRENGTH OF MATERIALS I 2 UNITS

Force equilibrium – free body diagrams.
Concept of stress, strain; Tensile test. Young's moduli and other strength factors.
Axially loaded bars, composite bars, temperature stresses and simple indeterminate problems. Hoop stresses in cylinders and rings. Bending moment, shear force and axial force diagrams for simple cases, Simple torsion and application.

BME 220: STUDENTS' WORK EXPERIENCE PROGRAMME 0 UNIT

Introduction to practices and skills through supervised hand-on workshop exercises in computer engineering and information & communication technology, and related general engineering. These exercises include simple domestic electrical installation, earthling methods, assembly, and maintenance of computer, computer networking, software packages installation, installation of satellite TVRO, maintenance of land line handset, and GSM handset, etc

CSC 201: COMPUTER PROGRAMMING METHODOLOGY 3 UNITS

Principles and practice of computer programming tools: flowcharts, decision tables, Input- Processing – Output charts, problem identification, feasibility study, system analysis, requirements: infrastructure, hardware, software, personnel and consumables. Program coding, walkthrough, debugging and test run using sample data. System documentation, evaluation, operation and maintenance.

CSC 202: OBJECT-ORIENTED PROGRAMMING 3 UNITS

Introduces the concepts of object-oriented programming to students with a background in the procedural paradigm. Review of control structures, functions and primitive data types. Object- oriented programming: Object oriented design; encapsulation and information hiding; separation of behaviour and implementation; classes, subclasses and inheritance; polymorphism; class hierarchies. Fundamental computing algorithms; simple and sorting algorithms (linear and binary search, selection and insertion sort). Fundamental of event-driven programming. Introduction to computer graphics: using a simple graphics tools. Overview of programming languages: History of programming languages; brief survey of programming paradigms. Virtual machines: the concept of a virtual machine; hierarchy of virtual machines; intermediate languages. Introducing to language translation: Comparison of interpreters and compilers; language translation phases; machine-dependent and machine-independent aspects of translation. Introduction to database systems: History and motivation for database systems; use of a database query language. Software evolution: software maintenance; characteristics of maintainable software; re-engineering; legacy systems; software reuse.

ECO 221: ECONOMICS FOR NON-MANAGEMENT STUDENT 2 UNITS

Nature and scope of Economics, Definition, Scope, Economic problems, micro and macro-economics, methodology of Economics. The Price System, Introduction, Theory of Demand, Theory of Supply, Market Equilibrium. Elasticity, Income Elasticity, Cross price elasticity. The Production process, Definition of Production, Factors of production, Production function, Long-Run and Short-Run, Production cost and profit maximization, National Income Accounting, Concept of National Income Approaches to National Income Accounting, Challenges of National Income Accounting, Uses of National Income Accounting, National Income Accounting as a measure of welfare. Money and Inflation, Definition, Functions, Forms of Money, Money Supply and Money Demand, Inflation Definition, Types and effects. Commercial and Central Banking, Function of Commercial Bank and Central Bank.

GES 202: PEACE STUDIES AND CONFLICT RESOLUTION 2 UNITS

The course is designed to take stock of a general introduction to the nature and complexity of conflicts and how they can be resolved. Students are expected to be brief on the absolute need to study such a course. The course will focus on the various types of conflicts; their causes and consequences, various levels of conflicts, strategies and tools (including traditional methods) of conflict resolution.

300 LEVEL

BME 301 INTRODUCTION TO BIOMEDICAL ENGINEERING 2 UNITS

Meaning of Biomedical Engineering. Scope & Application. Basic Principles and Philosophy of the program. Historical development of Biomedical Engineering. Relationship between Biomedical Engineering and Bioengineering. Definition of important terminologies. Components of- and Specialty areas- in Biomedical Engineering. Man as a machine. Research, Development, Education, Training, Certification and Practice of Biomedical Engineering. Safety and regulatory concerns. Ethical issues in Biomedical Engineering Practice. Problems and Prospects of Biomedical Engineering in Nigeria and Africa.

BME 302: MEDICAL BIOCHEMISTRY 2 UNITS

Enzymes. Carbohydrate metabolism. Lipid metabolism. Amino acids and protein metabolism. Gene action, Gene expression and molecular diseases (e.g. sickle cell). Hormones and metabolism; endocrinal diseases (e.g. goiter).

BME 303/BTE 203: INTRODUCTORY CELL AND MOLECULAR BIOLOGY 2 UNITS

Historical introduction. The Cell theory, Prokaryotic and Eukaryotic cells, Cell division, The Cell cycle, Structure and function of cells, Cytoplasmic organelles, Sources of energy for the cells, Properties of the Cell surface complex, Permeability and transport, membrane potential. Cellular dynamics (including cellular movements, structure of cytoplasm, cytoplasmic movements, muscular contraction). Cellular mechanisms in development and differentiation. The molecular nature of cells; cellular composition and macromolecular aggregations. Important biomolecules (their composition, nature of inter-unit bonding, consequence of intermolecular aggregations, sizes and shapes of the macromolecules, functions and turnover mechanism of the molecules. To be considered are; proteins, nucleic acids, selected carbohydrates including polysaccharides, lipids, enzymes, coenzymes and vitamins. Photosynthesis- the Light reaction, Dark reaction and respiration, the flow of energy; mitochondrion, the Kreb's cycle and Electron transport.

BME 305: HUMAN ANATOMY 2 UNITS

The Human body – an overview of the anatomy. Branches of Anatomy – Gross, Microscopic, Developmental, and Comparative Anatomy. Anatomical terminologies. Generalized animal cell. Histology (Epithelial, Connective, Muscle, Nerve Tissues). Skeletal System, Joints (Classification, movement and disorders of the joints). Nervous system (fundamentals. Central and peripheral nervous system). Anatomy of the Cardiovascular system, Digestive system, Respiratory system, Urinary system, Respiratory system.

BME 306: BIOMEDICAL ENGINEERING WORKSHOP PRACTICE 2 UNITS

Introduction to common equipment in a biomedical engineering workshop. Practical demonstration of use of tools and machines in performing basic equipment maintenance, repair and fault troubleshooting. Element of safety practice and general safety precautions. Practical demonstration of use of tools and machines in performing basic workshop processes. Hospital visits to appraise biomedical engineering practice.

BME 307: BIOMATERIALS SCIENCE I 2 UNITS

Properties of materials for bioengineering applications. Classes of materials used in biology and medicine; ceramics, glass, polymers, metals, natural materials, composites. Biocompatibility. Chemical structure and Physical properties of biomaterials. Degradative, Surface and Bulk properties of Biomaterials. Mechanical properties of biomaterials. Applications of materials in medicine and biology.

BME 308: BIOMEDICAL INSTRUMENTATION 3 UNITS

Introduction to Biomedical Instrumentation. Multimeter and waveform generator. Principles of operation and design of: Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG). Physiological signals. Origin of bio potentials (ECG, EMG, EEG). Biomedical signal detection, amplification and filtering and display. UV, visible and infra-red spectrophotometers. Blood cell counters. Audiometers. Automated Biochemical Analyser. Clinical applications of electrotherapy, short wave diathermy, ultrasonic diathermy, microwave diathermy, surgical diathermy unit, IR lamps, UV lamps.

TCE 301: SIGNALS AND SYSTEMS ANALYSIS 2 UNITS

Complex variables, vectors, and orthogonal functions. Types and classification of signals. Time and frequency domains of signal. Transforms in signal analysis, Fourier series, Fourier transforms, signal spectrum and analysis, convolution, power and energy of signals, probability functions of signals, correlation, cross-correlation and autocorrelation. Description and analysis of different types of Systems. Analysis of Time Domain Systems, Linear Time Invariant (LTI) systems, Discrete time systems, and so on. Frequency-domain system analysis using the Laplace transform. Continuous time convolutions. Discrete time convolution and transforms. Sampling theory, techniques and constraints. Sampling and reconstruction. Discrete Fourier transform. Introduction to application of Computer Software (MATLAB and LabVIEW) in Signal analysis and processing.

BME 309: BIOMEDICAL ENGINEERING LABORATORY 2 UNITS

Laboratory course designed to illustrate the practical and experimental aspects of all BME courses taught in class for the entire semester. Includes aspect of Bio-instrumentation, Biomechanics and aspects of Human Physiology

BME 310: BIOMATERIALS SCIENCE II 2 UNITS

Biocompatibility :- Definition,**Toxicity tests**: acute and chronic toxicity studies, sensitization, carcinogenicity, mutagenicity and special tests. **In-vivo testing (animals**): biological performance of implants. Standards of implant materials. **Biologic Recognition**:-Cell and Protein interactions with biomaterials. **Biologic Response:** Blood compatibility**;** Biomaterials and thrombosis, Wound healing

Infection, tumorigenesis and calcification. **Processing and fabrication of biomaterials**. **Preservation techniques for biomaterials**

BME 312: HUMAN PHYSIOLOGY 2 UNITS

Introduction: meaning, divisions/classifications and applications of physiology. **Cellular physiology**:- Cellular components and functions, cell junctions. **Physiology of the skin and membrane**:- Skin and Sweat Gland – Temperature regulation **Physiology of the gastro-intestinal system** {GIT}:-Digestion and absorption – Movement of GI tract **Physiology of the Musculoskeletal system**: Major Muscles of body and their actions, Properties of skeletal muscles, Contraction of skeletal. **Blood phyisiology**: Blood Composition – Fluid and electrolytic balance - Blood Groups – Estimation of RBC, WBC and platelet. **Overview of Immune system**: – Immune response – models of immune response – Autoimmune diseases. **Cardiac physiology**: Heart and vascular system – ECG – Blood Pressure – Cardiac output – Coronary and Peripheral Circulation – Heart Sounds. **Respiratory physiology**: Physiological aspects of respiration - Exchange of gases – Regulation of Respiration. Disturbance of respiration function, Pulmonary function test – Artificial respiration – Cardio-pulmonary Resuscitation. **Renal physiology**: Structure and function of kidneys and Nephron – Mechanism of Urine formation – Urine Reflex. **Physiology of special organs/senses**: Optics of Eye – Retina - Photochemistry of Vision – Accommodation Neurophysiology of Vision – EOG. Structure and functions Internal Ear - Mechanism of Hearing – Auditory pathway, Hearing Tests.

BME 314: BIOMECHANICS I 2 UNITS

Meaning and Definitions of Biomechanics. Review of Newton's Laws of Motion. Types of Motion. Balance, Equilibrium and Stability. Conservation of energy. Review of the physiology of the skeletal system. Mechanics of Musculoskeletal soft tissues. Joint articulating surface motion. Joint Lubrication. Cartilage, Ligament, Tendon, and Muscles. Significance of the Mechanics of Human Motion. Pseudo elasticity, nonlinear stress-strain relationship, viscoelasticity, structure, function and mechanical properties of skin, ligaments and tendons. Tools for measuring human movement. Principles of Biomechanical Analysis. Analysis of Gait. Power expenditure in walking. Factors affecting Mechanical work in Humans.

EEE 301: ENGINEERING MATHEMATICS III 3 UNITS

Matrices and matrix operations. Solution of system of linear equations by determinants. Linear ranking of matrice. Gaussian elimination. Characteristic polynomial, characteristic equation, eigenvalues and eigenvectors. Laplace's development. Multiple Integrals, Iterated integrals. Change of variables, Jacobians. Differentiation of integrals, Leibniz's rule. Vector Algebra. Line and surface integrals, Stoke's theorem. Volume integrals, divergence theorem. Orthogonal transformations. Cylindrical and spherical polar coordinate

systems. **Fourier** series. Fourier coefficients, Parsevals theorem. Complex form of Fourier series. Integral Transform: Inverse transforms (Fourier and Laplace). Application in boundary and initial value problems. **Z** transforms. Partial Differential Equations: Elementary properties of Gamma, Beta, Error, Bessel functions and Legendre polynomials. The wave, diffusion and Poisson's equations. Boundary and initial-value problems. D'Alembert's solution for wave equation. Method of separation of variables. Biharmonic equation.

EEE 302: ENGINEERING MATHEMATICS IV 3 UNITS

Finite difference. Interpolation. Numerical differentiation and integration. Numerical solution of ordinary differential equations, Trapezoidal, Simpson, Runge Kutta methods. Newton Raphson method for roots of equations. System of simultaneous linear equations. Linear simultaneous equations, Gaussian elimination, Gauss-Seidel iterative method, Jacobi Method, evaluation of determinant and inverse matrix. Eigensystem analysis: system stability, eigenvalue sensitivity, stability of Gauss-Seidel solution, amplitude and time scaling for model studies. Use of numerical analysis software packages to solve simple engineering problems.

EEE 305: ELECTRONICS ENGINEERING I 2 UNITS

Bipolar Junction Transistor (BJT): Transistor current components, Transistor configuration, operating point, Fixed bias, Emitter bias, bias stability, thermal stability. Graphical analysis of CE configuration, Transistor hybrid model, Input and output resistances, Voltage and current gains, Emitter follower, Cascading transistor amplifiers, Miller's Theorem and its dual, Common-emitter amplifier with simplified hybrid model. **Field Effect Transistor (FET) and** JFET characteristics, MOSFET, FET biasing Small-signal model, amplifier analysis, high frequency and Hybrid-∏ models, Single-stage CE amplifier analysis, Y-parameter model. Classification and analysis of Amplifiers, Distortion, frequency response, step response, RC coupled amplifier, effects of emitter bypass capacitor, frequency response of cascaded stages, noise. **Power Transistors and Power Amplifiers:** Darlington connection, NPN-PNP combination, Class A, B, AB and C Amplifiers, Push-pull design, Tuned amplifiers. Transistor Switches, Transistor monostable and astable multivibrators, Switching speed improvements, Solid-State Multivibrators.

EEE 308: ELECTRONICS ENGINEERING II 2 UNITS

Operational Amplifier: Ideal Op-Amp, Basic Op-Amp Circuits, Op-Amp applications. Op-amp input stage, input bias and offset current, input offset voltage, voltage drift, power supply rejection ratio, common-mode rejection ratio, offset error compensation, frequency response, transient response, slew rate, input and output impedances, noise, stability, gain and phase margins, frequency compensation, small and large signal characteristic. **Active Filters:** Biquadratic Transfer Functions, Filter types, Standard Responses, Sallen-Key Networks, Frequency and Impedance Scaling, Gain Adjustments, Frequency Transformations, State-variable configurations, High-Order filters. **Voltage Regulators:** Basic emitter-follower, Series feedback, Current limiter, over-voltage protection, and linear IC voltage regulators, Simple heat sink design. **Oscillators:** General principles of oscillation, Barkhausen Criterion, types of oscillators, Square-wave, Triangle-wave, and sawtooth generators. Nonlinear Circuit Applications: Comparators, Schmitt Triggers, Precision Rectifiers, Peak Detectors, Log/Antilog Amplifiers, Analogue Multipliers.

BUS 311: INTRODUCTION TO ENTREPRENEURAL STUDIES 2 UNITS

Course designed to provide students with general introduction to Entrepreneurship and to be enriched with case studies and students report on phased field trips as follows:

General Introduction to Entrepreneurship, what is Entrepreneurship and the role of the Entrepreneur in Nation Building. How are new Venture created. Business Resources, Entrepreneurial Financing Types of Enterprises, various approaches to the study of entrepreneurship. Relevance of Entrepreneurship to Society.

i. Case studies on example of successful Entrepreneurs.
ii. Planned field trips to successful Private owned Business Enterprises like OHL Ventures in "Otta Farm. Abeokuta and in Ibogun.

GES 302: INTRODUCTION TO PHILOSOPHY 2 UNITS

A brief survey of the main branches of Philosophy Symbolic Logic Special symbols in symbolic Logic- conjunction, negation, affirmation, disjunction, equivalent and conditional statements law of tort. The method of deduction using rules of inference and bi-conditionals qualification theory. Types of discourse, Nature of arguments, Validity and soundness; Techniques for evaluating arguments, Distinction between inductive and deductive inferences, etc. (Illustrations will be taken from familiar texts, Including literature materials, Novels, Law reports and newspaper publications).

400 LEVEL

BME 401: MOLECULAR BIOENGINEERING 2 UNITS

The mechanical properties of cells and biomolecules, cellular/molecular force generation and adhesion, the response of cells to their mechanical microenvironment, and mechanotransduction in response to various physical forces such as fluid shear stress. DNA-protein/RNA-protein interactions, protein folding and function, protein-protein and receptor-ligand interactions, lipids, polysaccharides, molecular motors, and the biophysics of macromolecules that function as therapeutics or engineered matrices. The engineering of nanoparticles for advanced drug delivery and molecular imaging applications, with particular focus on the interaction of such particles with living cells. Application of nanostructured materials to control the behaviour of cells and biomolecules.

BME 402: STUDENTS' INDUSTRIAL WORK EXPERIENCE SCHEME 6 UNITS

On the job experience in Industry chosen for its relevance to students area of specialization (26-week or 6-month as from the beginning of Second Semester and during the long vacation).

BME 403: BIOMECHANICS II 2 UNITS

Introduction to the basic principles of continuum mechanics of biological tissues and systems. Review of statics and strength of materials, continuum mechanics, and free-body diagrams. Mechanics of Hard tissues. Composition and structure of bone tissue. Cellular elements of bone tissue. Material behaviour of bone tissue. Forces and stresses in human joints, mechanics of the elbow, shoulder, spinal column, hip, knee, ankle and foot. Human locomotion, gait analysis and goniometry, Ergonomics, Foot Pressure measurements – Pedobarograph. Experimental determination of mechanical properties, derivation of constitutive equations. Tensions and analysis of residual tensions. Exercise Physiology.

BME 409: INTRODUCTION TO MEDICAL IMAGING 2 UNITS

X-ray imaging, Radionuclide imaging. Magnetic resonance imaging (MRI), and Ultrasound imaging, Mammography imaging, Computed Tomography Scanning. For each system the course describes the fundamentals principles of the wave generation and detection, the diagnostic methods, image characteristics, and the biological effects of the given wave.

BME 411: PHYSIOLOGICAL FLUID MECHANICS 3 UNITS

Review of the Anatomy and Physiology of the cardiovascular system. Comparison between blood, air and water as fluids; Reynolds Transport Theorem; Poiseuille flow; Lubrication Theory; Energy requirements of the heart in blood pumping; Mechanics of breathing; Gas exchange. Introduction to bio-transport phenomena.

BME 413: TISSUE ENGINEERING AND REGENERATIVE MEDICINE 2 UNITS

Tissue organization and dynamics. Cell and tissue characterization. Cell-matrix interactions. Transport processes in engineered tissues. Biomaterials and biological interfaces. Stem cells and interacting cell fate processes, and tissue engineering methods. Examples of tissue engineering approaches for regeneration of cartilage, bone, ligament, tendons, skin and liver. Cell transplantation for liver, musculoskeletal, cardiovascular, neural, and visceral tissue engineering. Ethical and regulatory issues of tissue engineering.

MCT 401: CONTROL SYSTEMS 3 UNITS

Laplace transformation, block diagrams and signal flow graphs system modelling and reconstruction. Modelling of electrical, mechanical and electromechanical systems; feedback, characteristics of DC generators and servo motors, Masson's gain formula. State space equation, Routh Hurwitz's stability criteria, root locus analysis and design, Bode plots, Magnitude and Phase angle plots. Digital control.

MEE 411: RESEARCH METHODS IN ENGINEERING 2 UNITS

Research Methods: strategy, scheduling, presentation; Engineering Research Tools: background, theories. Engineering ethics; Problem formulation – Initiation & Solving.

Principles and procedure of technical writing; organizing information, designing graphic aids, Research Project Report Structure- Abstracts, Citation, Standards. Plagiarism, Copyrights, Intellectual Property. Presentation Skills Seminar

CVE 413: GENERAL ENGINEERING PRACTICE 2 UNITS

Engineering works standards and measurements. Contracts and sub-contracts. Works construction and Supervision. Job planning and control-programme, charts, critical path methods, etc.

Construction, electrification, bridges, highway, industrial buildings, sewage works. The relationship among the professionals in Engineering. Contracting in engineering projects. Execution of engineering project and site organization. Techniques, procedure and plants involved in large-scale earth movement. Principles and construction of framework, floors and external works.

BUS 411: ENTREPRENEURIAL SKILLS DEVELOPMENT STUDIES 2 UNITS

Courses designed to be in eight week modules with three case studies and class assignments as follows: Who is an Entrepreneur? Major classification of Entrepreneurs. Methods of identify and ascertaining Entrepreneurial Business opportunities. Investment Cost estimation methodology. Determining Capital and operating requirements Raising Financial Capital- Sources and methods of enterprise financing. Simple methods of Risks Assessment, Business Plan Development and Presentation techniques Implementation procedure and Business management styles.

Safety, Security and Sustainability Considerations,

Course to be enriched with

i. Case studies and assignments on Business Opportunities assessment,
ii. Case studies of Business Risk Assessment procedure,
iii. Case studies and assignment on Business Plan Development.

500 LEVEL

BME 502: CLINICAL ENGINEERING 2 UNITS

Meaning and Definition of Clinical Engineering. Evolution of engineering and technology in healthcare. The healthcare environment. A model clinical engineering department. Roles/Function of a Clinical Engineering department in a hospital organization. Hospital operating system and Intensive care engineering. Clinical engineering in developing nations (e.g. Nigeria). Technology evaluation & procurement. Risk factor, safety and management of medical equipment. Quality control and compliance with standards. National Health Technology policy.

BME 505: BIOMEDICAL INFORMATICS 2 UNITS

Introduction. Health Management Information System. Database Design, Storage and Retrieval. Electronic Health Records. Electronic Medical Records. e-Health. m-Health. Medical networking, medical communication protocols, security and encryption in networked healthcare environment, Telemedicine. Medical expert systems. Clinical applications of information systems.

BME 506: APPLIED MEDICAL IMAGING 2 UNITS

Introduction to Imaging Physics and digital signal processing. Definition of Image; Image as a signal; Psychophysics of vision. Properties of images, Sampling, Quantization, Digitizing and Display of images; Geometric and algebraic processing, Spatial filtering; Image coding and transmission, Binary image analysis, Segmentation, Description of lines and shapes. Image processing, resolution, modulation, interference & Intensity. Digitization and Reconstruction of Images; Basic theory and physics of medical imaging; Interaction of Radiation with matter; nuclear magnetic resonance. MATLAB and Labview toolboxes for image processing

BME 507: PROSTHETICS, ORTHOTICS & ARTIFICIAL ORGANS 3 UNITS

Definition and meaning of prosthesis, Orthotics, Prosthetic and Orthotic devices. Principles of Socket fabrication of devices. Casting. Types of plastics used in socket fabrication (laminates, blends, thermoplastics, cosmetic finishing plastics). Types of prosthetic feet. Prosthetics knee Unit. Lower Limb Orthoses. Upper limb Prostheses. Spinal orthotics. Externally powered Prostheses and Orthoses

Review of Biomaterials used for artificial organs. Prosthetic Heart Valves. Evaluation Of Prosthetic Heart Valves. Cardiac pacemaker. Evaluation and implantation of a Pacemaker. Artificial Ear. Artificial Nose. Drug implants. Cochlear implant. Basic concept of blood connecting devices used as replacement for natural organs: Artificial kidney, lung valves, heart-lung bypass, total heart, and pancreas. Attempts at techniques of developing artificial organs where necessary; Biocompatibility and rehabilitation engineering.

BME 509: REHABILITATION ENGINEERING 3 UNITS

Brief History of Rehabilitation Engineering and Assistive Technology. Human component of Rehabilitation. Categories of Assistive Devices. Disabling conditions. Amputation as a disabling condition. Causes and Classification of limb amputation. Principles of Assistive Technology assessment. Principles of Rehabilitation Engineering (Analysis, Synthesis, Evaluation, Decision and Implementation). Key Engineering Principles. Key Ergonomic Principles. Wheel Chairs and Personal Mobility. Design and Fabrication of an Assistive Technology.

BME 511: BIO-TRANSPORT PHENOMENA 2 UNITS

Conservation and constitutive relations for mass and momentum and their application to diverse problems, such as protein adsorption to biomaterials, blood flow in arteries, receptor-ligand binding on a cell surface, oxygen delivery to tissues, and design of a hemodialysis unit

BME 513: HOSPITAL STRUCTURES IN DEVELOPING ECONOMIESUNITS 2 UNITS

Energy supply: Building construction (concrete mixer, interlocking blocks). Natural lighting. Cross ventilation. AC supply. DC supply. Solar power. Biogas. Charcoal, wood and maize cob furnace. Water supply: Rainwater harvesting and storage. Deep wells. Earthen dams and ponds. Channelization of streams. Sewage disposal: Ventilation Improved pit latrine. Use of waste water from the bathrooms for sewage disposal.

Hospital Organization and administration. Hospital design – consideration for movement and communication. Hospital equipment – Design and management. Operating table. Hospital beds and cots. Water distiller. Haematocrit centrifuge. Pedal suction pump. Histopathology equipment. Autoclaves

BME 514: TECHNOLOGY FOR HUMAN FUNCTION 2 UNITS

Practical application of technology in treating selected human health challenges: Neural stimulation for micturition.Vagal nerve stimulation for heart dysfunction (tachycardia). Deep Brain stimulation against epilepsy. Neural stimulation for the reduction of pain. Visual prosthesis. Deep brain stimulation for compulsive disorders. Phrenic nerve stimulation to restore respiration after spinal cord injury. Vagal nerve stimulation to reduce epileptic seizures. Trans-cranial magnetic stimulation. DC stimulation of the brain.

BME 518: BIOMEDICAL TELEMETRY 2 UNITS

Review of sensors and signals. Definition and Introduction to Telemetry systems. Applications and usage of Telemetry systems. Trends and Technology. Frequency Spectrum and Electromagnetic spectrum. Wireless Mobile Telecommunication systems, WMTS. Components of WMTS. Transmitters, Receivers, Modulation and Demodulation. Measurement, Monitoring and Control with Telemetry Systems. Radio Frequency, RF and RF Transmitters. Stationary and Ambulatory Telemetry Systems.

MEE 501: COMPUTER APPLICATIONS IN ENGINEERING DESIGNS 2 UNITS

Overview of Computer-Aided Design and Analysis. History of CAD/E, characteristics of CAD/E, overview of the industrial application of CAD, CAE, and CAM, functions of CAD/CAE/CAM systems, information embedded in a CAD system, tools commonly used in CAD. Hardware and software of a CAD/E System; Computer hardware, typical CAD/CAE.CAM system configuration, concepts of graphics display, various input and output devices, data structure and database management systems, graphical coordinate systems, software function and application modules. Geometric Transformation - 2-D and 3-D geometric transformation, projections, generation of multiple views for an engineering drawing Curve and Surface Modeling; Geometric Modeling; CAD/CAM data exchange methods, IGES, STEP and PDES

MEE 505: VALUATION OF ENGINEERING SYSTEMS 2 UNITS

Engineering Valuation Tools and Systems

Production System Concepts and Fundamentals; Time Study; Work Sampling; Data; Usage for Engineering System Design; Scheduling, PERT/CPM; Engineering Project Justification; Engineering Project Tools

EEE 512: ENGINEERING LAW 2 UNITS

Law ethics and conduct in engineering, legal definitions and specifications, application of business law to engineering, patents and inventions, trademarks and copyrights, contracts and contract documents. The structure and functions of organizations professional problems – legal responsibilities, professional liabilities, roles of engineers in law suits.

MEE 527: ENGINEERING MANAGEMENT 2 UNITS

Management: Organizational structure and behaviors; engineer to engineering manager transition; managerial functions, principles and techniques of planning, forecasting, organizing, technical activities; project selection and management; style of leadership and management techniques.

BME 524/ MKT 202: ELEMENTS OF MARKETING 3 UNITS

Introduction: Marketing definition and concepts, Evolution, Role and Importance. The Marketing System. The Market Analysis: The Marketing Environment, Buyer Behaviour Market Segmentation; Market Measurement and Forecasting; Marketing Research. The Marketing Mix: The Product Concept, Development and Life Cycle; Product Classification Marketing Strategies, Pricing, management of the Channels of Distribution. Promotion: Advertising, Personnel Selling, Public Relations and Sales Promotion, Marketing of Professional Services. Raising the Marketing Effort.

BME 522/ HRM 302: HUMAN RESOURCES MANAGEMENT 3 UNITS

The aim of this course is to provide students with an understanding of contemporary HRM and the important strategic role that it plays in helping an organization build and maintain competitive advantage. More specifically, the course will examine HR policies, practices, and systems in the area of: planning and recruitment; ethical and legal frameworks for HR; employee selection; training and development; performance management; compensation; employee relations; diversity management; OH&S; employee separation; and HRM in a global environment.

MEE 523:OPERATIONS RESEARCH 2 UNITS

Introduction to Operations Research – brief history, current trends, benefits and limitations
Linear Programming (LP) – use Matlab and Excel to solve a variety of LP problems, including Product Mix, Diet, Blending, Resource Allocation, Cost benefit-Trade off, Distribution Network and Personnel Scheduling. Sensitivity Analysis – use Matlab and Excel to perform sensitivity analysis of LP problems Other Models – Transportation, Assignment, Networks, Project Scheduling
Introduction to Integer and Nonlinear Programming

MEE 525:SUBSEA PIPELINE ENGINEERING 2 UNITS

Introduction to the marine & offshore environment. Various types and functions of offshore structures Design and analysis of underwater pipeline systems for deep waters. API 1111 Code.
Route selection, Pipelay crossing criteria. Laying methods. Subsea Pipeline material selection and corrosion control.

BME 515: PRINCIPLES OF RURAL MEDICAL PRACTICE 2 UNITS

The pyramidal structure of health care delivery system. Primary Health programmes in rural communities. The World Health Organization, WHO, and its functions. The Alma Ata Declaration and the concept of appropriate technology. The WHO's millennium development goals. The Biomedical Engineer and the health care team in rural practice. The students are also required to make a minimum of a 3-hours visit per semester to clinics and hospitals to enhance class room work.

BME 599: RESEARCH PROJECT 6 UNITS

Each student is required to undertake a project that gives productivity value to the academic knowledge gained in his\her field of study. The project will involve problem solving using engineering theories and techniques, and the implementation of the project design. The student is expected to design a possible solution to the problem, taking into account various aspects such as professionalism, economy, costing, and engineering viability.

CVE 504: TENDERING AND ESTIMATING 2 UNITS

Tendering Procedure, Types of tendering, Pubic Procurement Procedures; Pre-qualification of Contractors/Consultants; Procurement Act 2007; Contractual arrangements; Cost reimbursable contracts; Target cost contracts; negotiated contracts, management contracts; Design and build contracts; difference between building and civil engineering forms of contract; approximate estimates methods; Units methods; Superficial and cube method; taking off, abstracting and billing; Unit rate build-up, etc.

END OF COURSE CONTENT