AGRICULTURAL POWER AND MACHINERY ENGINEERING (option)

Course Code	Course Title	U	L	T	P
ABE 504	Mechanics of Deformation Bodies	3	2	-	1
ABE 506	Farm Machinery & Equipment Servicing and Maintenance	3	2	-	1
ABE 508	Design of Agricultural &Food Processing Machine II	3	2	-	1
ABE 510	Agricultural Machinery II	3	2	-	1
ABE 512	Operation and Management of Farm Machinery & Systems	3	2	-	1
ABE 530	Farm Transportation	3	2	1	-

WATER AND ECOLOGICAL RESOURCES ENGINEERING (option)

Course Code	Course Title	U	L	T	P
ABE 514	Rural Road Development and Maintenance	3	2	-	1
ABE 516	Drainage Engineering	3	2	-	1
ABE 518	Irrigation Engineering II	3	2	-	1
ABE 522	Agricultural and Waste Water Management II	3	2	-	1
ABE 530	Farm Transportation	3	2	-	1

ENVIRONMENTAL RESOURCES ENGINEERING (option)

Course Code	Course Title	U	L	T	P
ABE 522	Agricultural and Waste Water Management II	3	2	-	1
ABE 524	Environmental Engineering in Agriculture	3	2	-	1
ABE 530	Farm Transportation	3	2	-	1
EMT 306	Environmental Impact Assessment	2	2	-	-

AGRICULTURAL & RURAL STRUCTURES ENGINEERING (option)

Course Code	Course Title	U	L	T	P
ABE 526	Design of Environmental Control Structures II	3	2	-	1
ABE 514	Rural Road Development and Maintenance	3	2	-	1
ABE 528	Rural Power Generation & Supply II	3	2	-	1
ABE 530	Farm Transportation	3	2	-	1
CVE 512	Advanced Structural Mechanics	3	2	-	1

COURSE SYNOPSES

ABE 102: INTRODUCTION TO AGRICULTURAL AND BIO-RESOURCES ENGINEERING (1 Unit)

Definition of Agricultural Engineering various branches (options), Farm power – human, animal, mechanical, electrical, wind and hydro power; introduction to farm machinery – machine elements, machines for tillage, crop cultivation, seeding, weeding, plant protection, fertilization, harvesting, post harvest technology; Farm buildings such as farmstead and farm residence, animal shelters, storage structures, building materials; Post harvest technology – principles of crop drying, milling, processing, preservation, packaging; Principles of soil conservation, introduction to irrigation, drainage and farm electrification; scope of agricultural mechanization, elements of geometrical constructions; Job prospects for agricultural engineers.

ABE 106: ELEMENTARY FLUID FLOW (1 Unit)

Fluids and fluid properties. Flow properties, viscosity and inviscid flows Reynold's number; laminar flow, turbulence. Hydrostatics, Hydro-dynamics: Bernoulli and continuity equations. Simple application of fluid study to engineering

ABE 200: STUDENTS' WORK EXPERIENCE PROGRAMME (SWEP) (3 Units)

Students would be attached to mechanized agricultural farms within Abeokuta and it's environment for the long vacation period. Students would be expected to identify and receive some practical training and maintenance on agricultural field equipment such as tractors, land clearing equipment, liquid chemical sprayers and their components, mowers, land cultivation equipment, planting equipment, fertilizer applicators, crop harvesting equipment and irrigation equipment.

ABE 201: ENGINEERING DRAWING I (2 Units)

Revision of Orthographic projections, isometric projections. Dimensioning. and Sections. Advance engineering examples on two and three view representation (1st and 3rd angles), isometric drawing to include simple pictorial assembly drawing in isometric. Oblique drawing (Cavalier, Cabinet and Angles other than 45 degrees). Auxilliary views. Representation and specification of threads. Bolted joints. Keys and cottered joints. Conventional representations (see BS 308).

ABE 202: ENGINEERING DRAWING II (2 Units)

Interpretation of solids. Simple developments, intersection of curves and solids..Drawing of machine parts – cams, gears, couplings, bearings pipes, joints and valves. Detail drawing. Belts, Chains, Gears. Bearing and lubrication arrangements. Couplings brakes, Flexible shafts, Universal joints, etc. Simple and exploded assembly drawing. Revisions.

ABE 204: WORKSHOP PRACTICE (2 Units)

Workshop safety measures. Introduction to Workshop hand and powered tools emphasizing safety measures to be taken during operation. Workshop materials various gauges and measuring devices. General description of the function and capabilities of grinding machine, drilling machine, lathe machines milling machines, shaping machines and cutting machines. Practice in the use of machines. Welding bracing soldering and riveting. Carpentry: hand tools, materials, types of joints, processing of timber. Manufacture of simple components using steel and wood.

ABE 223: TECHNICAL DRAWING I (2 Units)

Use of drawing instruments, paper sizes, scales and drawing and lay-out. Lines and lettering. Geometrical drawings – plane geometry, cones and cycloids Elements of descriptive geometry and geometrical construction. Introduction to multi view projections; orthographic projection (first and third angle projection), Isometric drawing and isometric projection, sections and sectioning.

ABE 224: TECHNICAL DRAWING II (2 Units)

Revision of Orthographic projections, isometric projections. Dimensioning. and Sections. Advance engineering examples on two and three view representation (1st and 3rd angles), isometric drawing to include simple pictorial assembly drawing in isometric. Technical sketching. Conic sections. Interpenetration of surfaces and Surface development:- parallel and radial liner only.

ABE 297: SWEP SEMINAR& REPORT (2 Units)

Students would be expected to present a full report of activities in SWEP and make a seminar presentation to the department. Detailed report of students experience and activities during the period of attachment would be submitted by the students not later than the first week of the following semester. These records and other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by university and site based supervisors will be used for grading purposes.

ABE 300: INDUSTRIAL WORK EXPERIENCE (SIWES I) (3 Units)

Students would be attached to fish and poultry farms, animal houses, barns, silos, farm refrigeration units , processing , maintenance, fabrication, industrial and irrigation sites or other relevant areas of Agricultural and Bio-Resources Engineering. Students would be expected to receive practical training on the operations, construction and maintenance of such areas as highlighted above. Submission of reports and on site visitation by academic staff is required..

ABE 301: AGRICULTURAL MECHANICS (3 Units)

Selection, operation, sharpening, care and uses of shop tools and equipment, Wood working, concrete and masonry, iron working, blacksmithing, welding, cutting and

brazing. Glazing and sheet metal work. Introduction to Agricultural Equipment: Introduction to production agricultural field equipment with emphasis on optimizing machine performance. Topics discussed include farm tractors, tillage, fertilizer and chemical application, and seeding and harvesting grain and forages. Fabrication, maintenance and repair of farm field processing machines. Repair and maintenance of tractors and farm machinery. Laboratories will allow students to gain practical understanding of concepts introduced during lectures.

ABE 302: DESIGN OF AGRICULTURAL MACHINE ELEMENTS (3 Units)

Philosophy of design. Design as problem solving tool. Components of design, creative design, detail design (quantitative and qualitative). Engineering Design against failure (fatigue, creep, etc). Engineering materials and selection. Design and analysis of individual machine components – shafts, gears, chains, linkages, bearings, keys, keyways, belts, clutches, etc. Component assemblies and machine systems.

ABE 306: AGRICULTURAL LAND SURVEYING & GIS (2 Units)

Types of surveys, classes of surveys. Instruments and care, measurement of distances – pacing, stadia, taping, electronic and photographic methods. Earth's curvature and atmospheric refraction. Errors and corrections. Angles and directions – bearings and Azimuths, magnetic compass and earth's magnetic field. Changes in declination Compass traverse, Leveling – elevations topograpahic maps. The engineer's telescope, bubble tube, dumpy level, level rods, automatic level. Remote sensing Technology, introduction to GIS- Application, Data Capture and Representation, Digital Elevation Models, Spatial Analysis, Software.

ABE 303: HYDRAULICS ENGINEERING I (2 Units)

Fundamental principles of hydraulic, continuity, energy and momentum. Open channel flow: uniform flow, gradually varied flow. Flow resistance; manning and Chezy equations. Applications of the energy, momentum and continuity equations in combination. Specific energy. Flow in conduits: classification of laminar and turbulent flows. Losses inlets, bonds, outlets etc. Hydraulic structures, pumps and hydraulic model.

ABE 305: HYDROLOGY FOR ENGINEERS (3 Units)

Definition of Hydrology. The hydrologic cycle; Components of the hydrologic cycle. Precipitation- Extension and interpretation of rain gauge data; Evapotranspiration- The heat budget, Solar and earth radiation. Runoff- Stream gauging, hydrograph. Flood frequency and risk analysis. Groundwater: Percolation, Recharge, Discharge (Base Flow), Aquifer: Unconfined Aquifer, Confined Aquifer. Water Abstraction Methods. Well Hydraulics - Darcy's Law,

Partial Differential Equations Governing Groundwater Flows. Hydrologic and

mathematical modeling techniques; Black box models; Rainfall-runoff models; Deterministic and water budgeting models.

ABE 321: WORKSHOP PRACTICE AND FARM SHOP (2 Units)

Safely instruction, mensuration and introduction to the use of basic workshop tools. Sheet metal work (welding, bracing, soldering and riveting). Wood work and machine workshop. Farm tools (hoes, cutlass etc).

ABE 322: AGRICULTURAL MECHANIZATION (2 Units)

The concept of agricultural mechanization. Various levels. The mechanization process. Programme development – feasibility studies, economics of mechanization, etc. Machinery selection. Economics of machine use – fixed and variable costs, depreciation, obsolescence, salvage value, machine capacity, etc. Agricultural machinery management – equipment combination, decision on the purchase of new and /or used machinery, advantages and disadvantages of machinery ownership. Care and maintenance of agricultural machines. Working principles of single and double axle farm tractors, including spark ignition and compression ignition engines.

ABE 350: ENGINEERING ENTREPRENEURSHIP (2 Units)

Profiles of business ventures in the various business sectors such as: Water treatment/conditioning/packaging; Food processing/preservation/packaging; Metal fabrication; Tanning industry; Vegetable oil extraction; Farming; Fisheries/aquaculture; Refrigeration/Air-conditioning; and other sectors related to Agric.& Bio-Resources. Case Study Methodology applied to the development and administration of Cases that bring out key issues of business environment, start-up, pains and gains of growth of businesses, etc. with particular reference to Nigerian businesses. Experience sharing by business actors in the economy with students during Case presentations.

ABE 397: SIWES I SEMINAR (2 Units)

Students would be expected to be present a full report of activities in SIWES I and make a seminar presentation to the department.

ABE 400: STUDENTS' INDUSTRIAL WORK EXPERIENCE SCHEME II (SIWES II) (8 Units)

Students would be attached to agricultural & Bio-Resources related industries including processing,, fabrication, building, infrastructural, water, waterways, production, energy or other related industries/projects for the second semester for the 400 level and the following long vacation. Students would be expected to receive practical training in production, quality control, engineering and maintenance as well as marketing under industrial condition and supervision. Multiple visit by

University based Supervisors are required for adequate monitoring of industrial trainees.

ABE 401: AGRICULTURAL MACHINERY I (3 Units)

Short review of the development of mechanization in various branches of agriculture. Land clearing techniques and equipments. Types of farm machinery and their field management requirements. Machine performance, costs of machine use. Farm cultural operations: clearing, tillage, planting, cultivation, fertilizer and insecticide application, harvesting. Land leveling and earth moving. Safe operation of agricultural machinery. Selection of machinery to suit the performance requirement of various agricultural operations and Nigerian conditions.

ABE 403 : ENGINEERING PROPERTIES AND PROCESSING OF BIO- MATERIALS I (3 Units)

Physical and mechanical properties of agricultural materials. Thermal properties of agricultural and bio-materials. Moisture equilibration. Air movement. Drying theory – thin layer and deep bed drying. Design of drying systems. Storage principles and practice. Principles and applications of the rheology of foods. Primary and secondary processing of agricultural products used in the agri-food industry. Thermal, electrical and optical properties of agricultural materials, foods and feeds of plant and animal origin.

ABE 405: IRRIGATION & DRAINAGE ENGINEERING I (3 Units)

Pumps: hydraulic characteristic and selection for varying duties. Irrigation scheduling. Salt problems in irrigated agriculture, leaching and reclamation of saline and alkaline soils. Theories for steady and non-steady state flow problems of heavy soils, surface flow. Farm drainage – surface and sub-surface systems, open mole and pipe drainage techniques, installation, maintenance and machinery requirements. Filter materials. Design of drainage schemes.

ABE 407: INTRODUCTION TO AGRICULTURAL STRUCTURES DESIGNS (3 Units)

Introduction to agricultural structures. Selection of materials in relation to use – steel, wood, concrete and masonry. Types of structural frames. Estimating loads, stress analysis. Introduction to structural design.- philosophy of design, elastic and plastic design concepts. Reinforced concrete design. Design for axial loadings. Design of beams, foundation, slab, connections and joints. Computer concept for improved analysis and design. Design project.

ABE 411: BIO-INSTRUMENTATION & MECHATRONICS (2 Units)

Static and dynamic characteristics of transducers and circuits used in the measurement of variables such as force, pressure, strain, temperature, humidity and electromagnetic radiation. Introduction to data loggers and digital data

acquisition. Fundamental principles of transducers and associated circuitry. Design and selection of measurement systems.The applications and function of controllers and monitors in modern agricultural systems, including precision agriculture.. Fundamental electrical principles and their application to system components will be introduced. Case studies will allow students to study specific components in a control or monitoring system and understand their interrelationships in the overall system. System diagnostics will be discussed throughout the course.

ABE 413: ENGINEERING COMMUNICATION (2 Units)

Principles of effective engineering communication. Professional use of the English language in Engineering Practices. Principles of technical writing. Oral presentation of technical ideas, seminars and reports

ABE 415: CURRENT TOPICS IN MACHINES FOR BIOTECHNOLOGY (2 Units)

Introduction to Biotechnology, application of biotechnology to engineering with emphasis on agricultural and Bio-Resources Engineering. Recent advances and findings in biotechnology.

ABE 417: INTRODUCTION TO BIO-RESOURCES ENGINEERING (2 Units)

Introduction to the discipline of Agricultural and Bio resource (Biosystems) Engineering.Design principles and practices in Bio-system engineering where students will develop logical problem-solving skills through solution of problems involving energy and mass balances, bioprocessing, instrumentation and machinery systems, water and soil resources and waste management. Extensive use is made of computer software for calculation and graphical presentation of results

AGE 443: STATISTICS FOR ENGINEERS (3 Units)

Probability, random variables, distribution and density functions, expectations. Central Limit Theorem. Estimation of parameters, confidence intervals. Definition and approaches of probability. Mutual exclusiveness. Independent and conditional events and their probabilities. Bayes theorem.

Continuous and discrete random variables. Sampling from populations, random numbers, and sampling distributions. Estimation of parameters; point and interval. Hypothesis and significance tests; testing equality of means and proportions. Use of CHI square, and t-tests. Analysis of variance, fitting of curves. Regression: least squares fit, correlation. Quality control: acceptance sampling. Experimental Design and analysis.

ABE 497: SIWES II SEMINAR &REPORT (2 Units)

Detailed report of students experience and activities during the period of SIWES II would be submitted by the students not later than the first week of the following semester and make a seminar presentation to the department.. These records and

other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by university and site based supervisors will be used for grading purposes.

ABE 501: AGRICULTURAL POWER SYSTEMS I (3 Units)

Power sources on the farm. Development of the tractor. Internal combustion engine cycles, efficiencies and operations. Fuels and combustion of fuel. Constructional features and operation of tractor engines – spark ignition systems, lubrication and lubrication systems. Engine cooling and cooling systems. Design of spark ignition and compression ignition engines. Systems study of internal combustion engines and power-transfer machinery components as used in modern agricultural enterprises. Functions and interactions of components in mobile agricultural power sources and power-transfer mechanisms. Power transmission through machines from the source to the work component. Internal combustion engine systems, clutches, transmissions, differentials, final drives, PTO's, hydraulics, hydrostatic drives, and chain and belt drives. Tractor driving and operation with implements.

ABE 502: AGRICULTURAL MECHANIZATION (3 Units)

Nature and objectives of agricultural mechanisation. The concept of agricultural mechanization. Various levels. The mechanization process. Programme development – feasibility studies, economics of mechanization, etc. Machinery selection. Economics of machine use – fixed and variable costs, depreciation, obsolescence, salvage value, machine capacity, etc. Agricultural machinery management – equipment combination, decision on the purchase of new and /or used machinery, advantages and disadvantages of machinery ownership. Agricultural mechanisation as a strategy for rural development. Impact on food production and on infrastructural development. Linkages with rural Industries. Case studies of selected farms.

ABE 503: RURAL POWER GENERATION & SUPPLY I (3 Units)

Electricity as a power source on the farm lighting, farm production and processing. Planning the farm stead distribution system:- demand load for farm buildings and workshops, central metering and distribution, capacity of main service. Selecting feeder conductors. Electric centrol and circuit protection. Electric motor selection.Electrical codes, tariffs and regulations. Generation and transmission of electricity, Farmstead distribution systems. Testing procedure. Power factor correction. Selection and use of electric motors. Transformers. Energy conversion. Application of electricity to handling, processing and storage of agricultural products. Basic electronic applications to farm electrical processes.

ABE 504: MECHANICS OF DEFORMATION BODIES (3 Units)

Three dimensional stress and strain. Theories of failure. Stress concentration. Moments and products of inertia and area. Mohr's strain and inertia circles. Unsymmetrical bending, shear center. Curved beams.

ABE 505: SOIL & WATER CONSERVATION ENGINEERING (3 Units)

Soil-water-plant relationship and application in agricultural engineering projects. Principles of soil conservation. Classes, types and forms of soil erosion. Classification, processes, factors, analysis and measurements of water erosion and wind erosion. Erosion control measures

ABE 506: FARM MACHINERY & EQUIPMENT SERVICING AND MAINTENANCE (3 Units)

Principles of design, construction, testing and operation of machines used for land clearing, tillage, seeding, planting, fertilizing, weed control, thinning, spraying, dusting, stalk cutting, forage harvesting, harvesting of field crops and fruits. Machinery used in major farm operations and their applicability to Nigeria. Performance evaluation of some machinery such as planters, forage harvester, etc. Land reclaimation techniques and equipment. Further topics in combine harvester. Class project

ABE 507: AGRICULTURAL LAND CLEARING & DEVELOPMENT (3 Units)

Land resources and Land Use Act in relation to Nigerian agriculture. Objectives, methods and equipment for land clearing and development. Machinery selection, mechanics of operation and vegetation types. Land reclamation. Earthmovingmachinery and earthmoving mechanics.

ABE 508: DESIGN OF AGRIC. & FOOD PROCESSING MACHINES II (3 Units)

Mechanical power transmission: gear drives, belt drives, chain drives, ropes and hoists, springs as applied to food and agricultural processing machines. Bearings, welding, brakes, clutches and couplings. Vibrations in machine design. Design of food separation unit operations including concentration and dehydration. Computer aided design. Design project.

ABE 509: ADVANCED THERMODYNAMICS (3 Units)

Thermodynamics of gases, vapours and reactive and non-reactive mixtures. Process relations. Concepts of equilibrium and reversibility.

ABE 510: AGRICULTURAL MACHINERY II (3 Units)

Force analysis and design consideration of various farm machinery. Hitching methods, Power requirement for operating farm equipment and machines. Operation and maintenance of various farm machinery. Field evaluation and criteria for replacement of farm machinery. Cost analysis of the use of agricultural

machines.

ABE 511: AGRICULTURAL POWER SYSTEMS II (3 Units)

The tractor power transmission system. Tractor design and constructional features, stability analysis/mechanics of farm tractor chassis. Traction theory, human factors in tractor design and utilization, the tractor hydraulic system. Performance, operation and testing of agricultural power units. Tractor selection, utilization and preventive maintenance. Tractor power cost estimation. Machinery management, including scheduled maintenance programs, machine replacement strategies and machine cost analyses will be discussed. Tractor driving and operation with implements (Practical class).

ABE 512: OPERATION AND MANAGEMENT OF FARM MACHINERY & SYSTEMS (3 Units)

Integrated approach to machinery usage and agricultural production sequence. Equipment selection and scheduling of operation, seasonality factor. Machinery management. Machinery ownership and financing. Gross margin analysis. Optimization of machinery – input combinations. Management of farm enterprise. Case studies of farms in the university or established farm within the university area.

ABE 513: AGRICULTURAL & FOOD PROCESS ENGINEERING (3 Units)

Basic principles of agricultural food and food calculations. Agricultural and food processing operations. Design features of food processing equipment. Mass transfer including application in contact equilibrium process. Mechanical separation processes. Theory of the food. Food emulsion. Agricultural and food rheology and texture.

ABE 514: RURAL ROAD DEVELOPMENT AND MAINTENANCE (3 Units)

Means of transportation. Road: History and uses. Road types and classifications. Farm roads, Feeder road, Asphalted road, earth road, etc. Major differences between conventional and rural roads. Components of road. Construction materials for roads. Road stabilization and stabilization materials. Rural road design, construction and maintenance. Land clearing for road construction: Equipment and method. Equipment for road construction and maintenance.

ABE 515: ENGINEERING PROPERTIES AND PROCESSING OF BIO- MATERIALS II (3 Units)

Interaction between air, water and materials in post-harvest and manufacturing processes. Major topics in post-harvest technology will be considered, with emphasis on drying, cooling, storing, grading, sorting and transport of agricultural products. In addition, utilization and further processing of various commodities (cereals, oilseeds, dairy products, meat and special crops) will be presented,

including chemical composition, processing technologies, storage and packaging. Interrelationships of the various components of the value-added chain. Visit to mechanized agricultural and food industry. Class project.

ABE 516: DRAINAGE ENGINEERING (3 Units)

Surface drainage. Subsurface drainage. Design of drainage systems. Envelope materials and their design. Loads on conduits. Drainage pumping. Construction and installation of drains. Maintenance of drains.

ABE 517: FOOD AND CROP STORAGE TECHNOLOGY (3 Units)

Basic principles of crop storage and preservation. Types of storage structures – traditional and improved systems. Pest and insect infestation in stored products and storage structures. Storage structures for grains, semi-perishable crops (e.g potatoes, yams, etc) and perishable (e.g fruits and vegetables). Strategic food reserves.

ABE 518: IRRIGATION ENGINEERING II (3 Units)

Design of open channels. Water flow measurement. Pumping power requirements. Design of irrigation systems: border, sprinkler, drip, etc. Salinity and quality of irrigation water. Reclamation of saline and alkali soils. Seepage from canals and canal lining. Design of an irrigation project. Evaluating irrigation systems and practices. Irrigation water management

ABE 519: SOLAR ENERGY APPLICATIONS FOR BIO-RESOURCE ENGINEERS (3 Units)

Fundamentals of solar radiation. Solar heating and cooling, Heat transfer, solar energy conversion efficiency. Principles of solar collectors. Solar heat storage and storage systems for tropical crops. Application of Solar as renewable energy. Mini Project

ABE 520: FOOD ENGINEERING (3 Units)

Introduction to Food Engineering and definitions. Heat and mass transfers in food processing Insulation, Heat exchangers-design and applications. Heat and cold preservation of foods. Food packaging, Food quality control. Unit operations in Food Engineering, material and energy balance, thermal processes and psychometric

ABE 521: IRRIGATION ENGINEERING I (3 Units)

Irrigation principles. Land preparation and development for irrigation. Irrigation System design, Surface Irrigation- basin, border, strip, Sprinkler Irrigation- Spray Gun, trickle irrigation systems. Irrigation pipes and pipelines, Canals- lined and unlined, Irrigation water quality etc.

ABE 522: AGRICULTURAL WASTE MANAGEMENT II (3Units)

Nature of wastes, Impact on environment Waste and wastewater analysis. Engineering analysis and design of systems for the collection, storage, treatment, transport, and utilization of disposable organic wastes and wastewaters. Energy from waste products. Gaseous waste treatment. Field trips to operating systems and laboratory evaluation of materials and processes..

ABE 523: HYDRAULICS ENGINEERING II (3 Units)

Pipe flow, Pipes in parallel and in series. Branched pipes. Simple pipe network. Water hammer. Hardy Cross method of water distribution. Open channel flow. Channel transition and control. Hydraulic jump. Backwater curves. Dimensional analysis and similitude. Reservoir hydraulics and planning. High pressure outlets, gates, valves.

ABE 524: ENVIRONMENTAL ENGINEERING IN AGRICULTURE (3Units)

Design of unit operations and processes in water and wastewater treatment. Sedimentation. Chemical coagulation. Ion exchange. Filtration. Disinfection. Water supply treatment and distribution. Water quality. Wastewater handling, treatment and disposal. Solid waste disposal. Air pollution and control. Definition of pollution. Human causes of pollution. Water and air pollution. Sources of air and water pollution. Solid pollutant. Effects on human health. Measure to control pollutants. Noise pollution, heavy metal pollution. Resource conservation, Energy conservation, Pollutionreduction, Land conservation and Economic conservation

ABE 525: AGRICULTURAL AND WASTE WATER MANAGEMENT I (3Units)

Waste water classification. Sewage and sewerage conditions. Methods of waste water detoxification and disposal. Well development. Water treatment. Potable water production. Drainage and waste water treatment

ABE 526: DESIGN OF ENVIRONMENTAL CONTROL STRUCTURES II (3 Units)

Environmental requirements for man, plants, and animals and their control. Design of environmental systems for plants and animal production. Determination and design for the environmental needs in farm buildings. Ventilation and refrigeration. Solar heat load. Humidity control. Insulation and ventilation for environmental control. Design of unit operation.

ABE 527: DESIGN OF ENVIRONMENTAL CONTROL STRUCTURES I (3 Units)

Farmstead planning and layout. Integrated study of farm housing – family housing, livestock housing, farm products and food storage structures. Environmental control and structural requirements of crops and livestock. Design of structural members of wood, steel, plain and reinforced concrete and local materials. Design of farm structures, columns, beams nailed and local bolted connections of timbers.

ABE 528: Rural Power Generation & Supply II (3 Units)

Care and maintenance of electrical farm installations and machines – hatcheries, milking machines, feed mills, etc. Stand-by power units; purpose and importance, stand-by power generator types, selection, maintenance and operation. Introduction to electronics and controls in agriculture. The applications and function of controllers and monitors in modern agricultural systems, including precision agriculture. Introduction to fundamental electrical principles and their application to system components. Case studies, which will allow students to study specific components in a control or monitoring system and understand their interrelationships in the overall system. System diagnostics.

ABE 529: FOUNDATION ENGINEERING (3 Units)

Stress in soils. Consolidation, compaction, CBR and soil improvement, stability of slopes. Earth pressure analysis. Bearing capacity and settlement analysis of shallow and deep foundations. Design of footings, foundations, retaining walls. Analysis and control of groundwater.

ABE 530: FARM TRANSPORTATION (3 Units)

Farm roads. Farm transportation system. Development and construction of farm transport equipment. Farm transport system – standards and specifications. Ergonomics.

ABE 535: WATER RESOURCES ENGINEERING (3 Units)

Definition and scope of water resources development. Occurrence, uses, supply and demand. Methods of increasing availability. Flood control, water power water supply and recreation. Design, construction, operation and maintenance of farm ponds, reservoirs and fish ponds. Conjunctive use of water resources and water right. Water quality management. Introduction to issues, operational aspects, and regulations of water management as they pertain to prairie agricultural systems. Topics covered include occurrence and control of run-off (erosion and flood control); irrigation systems (requirements and scheduling); drainage of agricultural lands (wetland and salinity control); dry land soil water conservation; water quality maintenance with regard to dugouts, wells, and riparian areas; and government regulations governing water use, pollution and quality maintenance.

ABE 597: SEMINAR I (1 Units)

Each student is expected to carry out a significant design project in Agricultural & Bio-Resources Engineering under the supervision of an academic staff or a supervisory panel of academic staff. The student is expected to make an oral presentation at a proposal (pre-data) seminar on the project topic.

ABE 598: SEMINAR II **(1 Units)**

Each student is expected to carry out a significant design project in Agricultural & Bio-Resources Engineering under the supervision of an academic staff or a supervisory panel of academic staff. The student is expected to make an oral presentation at a proposal (post-data) seminar on the project topic.

ABE 599: PROJECT **(4 Units)**

The final year project could be directed at solving an identified problem related to Agricultural & Bio-Resources Engineering. The project may originate from staff, students, or external sources. They may have a diverse nature and serve diverse needs. Multi-disciplinary projects are encouraged. A final report on the research project should be compiled, typed and bound in a format designed by the department. The seminar presentation, the project reports, and the student's performance at a viva-voce defence before a panel of internal and external examiners will be used in different degrees in the assessments of the students' projects.

DEPARTMENT OF CIVIL ENGINEERING

Philosophy

Regardless of how developed infrastructurally a nation is, new constructions, rehabilitation, remodeling upgrading, expansion, etc., will always be intensive, more so in developing/emerging nations, and opportunities continue to abound for Civil Engineers till the end of time! Hence, the need to replace present and archaic techniques in project production with modern more sophisticated techniques; take advantage of opportunities in infrastructural development nationwide and internationally through know-how in management and entrepreneurial skills; facing challenges in technologies of new construction materials, heavy machinery, in the construction of very tall buildings, flood control, natural disaster management, pollution control, computer software and programmes, robotics, space engineering and constantly enhance human quality of life, make a career in Civil Engineering indispensable to Nigeria's vision of the millennium which is to make her one of the largest industrial nations of the world in the shortest time possible.

Therefore, the general Philosophy of Civil Engineering programme at FUNAAB is to produce skilled, resourceful, creative and fastidious manpower with high academic standard and industrial exposure who understand the fundamentals and principles of the discipline, and who can be confident enough to start their own businesses, be immediately employable nationally and internationally, as well as generate appropriate technologies for the nation's developmental programme in all the areas related to the discipline and agricultural development.

Objectives

The Objective of the undergraduate programme in Civil Engineering is to produce high level manpower who are expected to become self-reliant and competent in the infrastructural development goals of this nation and the Diaspora, either as owners or heads of national and multi-nationals in the areas of infrastructural development, or as government policy formulators at various tiers of government or as heads of educational and research organizations, etc. after some year of graduation.

The objectives of Civil Engineering Curriculum in the Department are:

i. To train students who have competence in the development of ideas and concepts for the solution of practical civil engineering and agricultural problems using divergent and inductive thinking.
ii. To train students who will use appropriate technology to modernize civil engineering and agricultural production, processing, storage, preservation and distribution.
iii. To train students who will exercise initiative, judgment and creative ability in the use of engineering principles for the solution of civil engineering and agricultural problems.

iv. To expose students to the practical aspects of their training so as to prepare them for actual working conditions on graduation through carefully designed and supervised industrial training and site visits.

Hence upon graduation, products of the programme will possess Qualification accredited by National Universities Commission and registerable with Council for the Regulation of Engineering in Nigeria (COREN) and other such bodies worldwide.

Academic Staff

NAME	QUALIFICATION	SPECIALIZATION	DESIGNATION
A. A. Badejo	B.Sc., M.Sc., Ph.D. (Ibadan)., MNSE, COREN Regd.	Water Resources and Environmental Engineering	Senior Lecturer/ Ag. Head of Department
O. S. Awokola	OND(Ibadan), B.A. Sc. (Ottawa)., M.Sc. (Dar –Es-salam), Ph.D. (Abeokuta). COREN Regd.	Water Resources and Environmental Engineering	Professor
A. A. Adekunle	B. Eng. (Markudi), M.Sc. (Lagos)., Ph.D. (Abeokuta). FNSE, COREN Regd.	Water Resources and Environmental Engineering	Senior Lecturer
J. O. Akinyele	B.Sc., M.Sc., Ph.D. (Ibadan). MNSE, COREN Regd.	Structural Engineering	Senior Lecturer
O. S. Abiola	B.Sc. (Ile-Ife)., M.Sc. (Ibadan)., Ph.D. (Abeokuta).,MNSE, COREN Regd.	Highway and Transportation	Senior Lecturer
S. O. Odunfa	B.Sc. (Ilorin), M.Sc.(Ibadan), Ph.D. (Abeokuta), MNSE, COREN Regd.	Highway and Transportation Engineering	Senior Lecturer
Funmilayo , M. Alayaki	B.Sc., M.Sc. (Lagos).,Ph.D. (Cambridg e) MNSE, COREN Regd.	Geotechnical Engineering	Lecturer I
U.T. Igba	B.Sc. (Abeokuta), M.Sc. (Scotland)	Structural Engineering	Lecturer II
F. Nkeshita	B.Sc. (Zaria), M.Sc. (Ibadan)	Water Resources and Environmental Engineering	Lecturer II

COURSE OUTLINE

100 Level: First Semester

Course Code	Course Title	U	L	T	P
GNS 101	Use of English	2	2	-	-
GNS 111	Introduction to Social Problems	1	1	-	-
MCE 101	Introduction to Engineering Drawing	2	2	-	-
CHM 101	Physical Chemistry	3	2	1	-
CHM 191	Practical Chemistry I	1	-	-	1
MTS 101	Algebra	3	2	1	-
MTS 103	Vectors and Geometry	2	2	-	-
PHS 101	General Physics I	3	2	-	1
PHS 191	Physics Laboratory I	1	-	-	1
MCE 103	Introduction to Mechanics I	1	-	1	-
GNS 102	Introduction to Nigerian History	1	1	-	-
GNS 203	Use of Library	1	1	-	-
Total		**21**	**15**	**3**	**3**

100 level: Second Semester

Course Code	Course Title	U	L	T	P
CVE 102	Introduction to Civil Engineering	1	1	-	-
ABE 106	Elementary Fluid Flow	1	1	-	-
CHM 102	Introductory Organic Chemistry	2	2	-	-
CHM 104	Introductory Inorganic Chemistry	2	2	-	-
CHM 192	Practical Chemistry II	1	-	-	1
MTS 102	Calculus and Trigonometry	3	2	1	-
MTS 104	Mechanics	3	2	1	-
PHS 102	General Physics II	3	2	1	-
PHS 192	Physics Laboratory II	1	-	-	1
STS 102	Introduction to Statistics	2	2	-	-
Total		**19**	**14**	**3**	**2**

200 Level: First Semester

Course Code	Course Title	U	L	T	P
ABE 201	Engineering Drawing I	2	1	-	1
CVE 201	Engineer in Society	1	1	-	-
MCE 201	Engineering Mechanics I	2	2	-	-
MCE 203	Engineering Materials	3	2	1	-
MCE 205	Fluid Mechanics I	3	2	1	-
ELE 201	Applied Electricity I	2	2	-	-
ELE 203	Fundamentals of Information and Communication Technology	2	1	-	1
ELE 291	Applied Electricity Laboratory I	1	-	-	1
CSC 201	Introduction to Computer Science	3	2	-	1
GNS 201	Writing and Literary Appreciation	1	1	-	-
MTS 201	Mathematical Foundations	3	2	1	-
Total		**23**	**16**	**3**	**4**

200 Level: Second Semester

Course Code	Course Title	U	L	T	P
ABE 202	Engineering Drawing II	2	1	-	1
ABE 204	Workshop Practice	2	1	-	1
CVE 202	Strength of Materials	2	2	-	-
ELE 202	Applied Electricity II	2	2	-	-
ELE 292	Applied Electricity Laboratory II	1	-	-	1
MCE 202	Engineering Mechanics II	2	2	-	-
MCE 204	Engineering Thermodynamics	3	2	-	1
MTS 232	Ordinary Differential Equations	2	2	-	-
GNS 204	Logic and History of Science	2	2		
GNS 206	Peace and Conflict Resolution	2	2	-	-
ETS 206	Entrepreneurial Studies & Change Management	2	2	-	-
Total		**22**	**18**	**-**	**4**

300 Level: First Semester

Course Code	Course Title	U	L	T	P
CVE 301	Engineering Surveying and Photogrammetry I	3	2	-	1
CVE 305	Structural Analysis I	3	2	-	1
CVE 309	Civil Engineering Materials	3	2	-	1
CVE 311	Engineering Geology	3	2	1	-
CVE 321	Studio Design I	2	-	-	2
MCE 323	Fluid Mechanics II	3	2	1	-
MCE 317	Strength of Materials II	3	2	1	-
MCE 341	Engineering Mathematics I	3	3	-	-
Total		**23**	**15**	**3**	**5**

300 Level: Second Semester

Course Code	Course Title	U	L	T	P
CVE 304	Hydraulics	3	2	-	1
CVE 328	Design of Structures I	3	2	1	-
CVE 308	Soil Mechanics	3	2	-	1
CVE 318	Elements of Architecture	3	2	1	-
CVE 320	Hydrology	3	2	-	1
CVE 326	Studio Design II	2	-	-	2
CVE 324	Civil Engineering Drawing	2	1	-	1
CVE 350	Engineering Entrepreneurship I	2	2	-	-
ELE 342	Engineering Mathematics II	3	3	-	-
Total		**24**	**16**	**2**	**6**

400 Level: First Semester

Course Code	Course Title	U	L	T	P
CVE 403	Civil Engineering Practice	2	2	-	-
CVE 405	Structural Analysis II	3	2	-	1
CVE 415	Soil Mechanics II	3	2	-	1
CVE 417	Design of Structures II	2	2	-	-
CVE 423	Engineering Surveying and Photogrammetry II	3	2	-	1
CVE 425	Highway Engineering I	3	2	-	1
ABE 413	Engineering Communication	2	2	-	-
ABE 443	Statistics for Engineers	3	2	1	-
Total		**21**	**16**	**1**	**4**

400 Level: Second Semester

Course Code	Course Title	U	L	T	P
CVE 200	Students' Work Experience Programme	3	-	-	3
CVE 297	SWEP Seminar & Report	2	-	-	2
CVE 300	Students' Industrial Work Experience Scheme (SIWES) I	3	-	-	3
CVE 397	SIWES I Seminar & Report	2	-	-	2
CVE 400	Students' Industrial Work Experience Scheme II (SIWES II)	8	-	-	8
CVE 497	SIWES II Seminar & Report	2	-	-	2
	Total	**20**	**-**	**-**	**20**

500 Level: First Semester

Course Code	Course Title	U	L	T	P
CVE 501	Structural Analysis III	3	2	-	1
CVE 509	Engineering Entrepreneurship II	2	1	1	-
CVE 515	Engineering Project Management	2	2	-	-
CVE 523	Highway Engineering II	3	2	-	1
CVE 525	Water Resources Engineering	3	2	-	1
CVE 527	Environmental Engineering	3	2	-	1
CVE 529	Terotechnology	2	2	-	-
CVE 597	Seminar I	1	-	-	1
	Elective (1 No.)	3	3	-	-
Total		**22**	**16**	**1**	**5**
ELECTIVES					
CVE 511	Construction Plants & Equipment	3	-	-	-
CVE 513	Embankment Dam Engineering	3	-	-	-
CVE 519	Numerical Methods in Structural Engineering	3	-	-	-
ABE 505	Soil and Water Conservation Engineering	3	-	-	-

500 Level: Second Semester

Course Code	Course Title	Unit	L	T	P
CVE 502	Irrigation and Drainage Engineering	3	2	1	-
CVE 504	Geotechnical Engineering	3	2	1	-
CVE 508	Design of Structures III	3	2	-	1
CVE 520	Transportation Engineering	3	2		1
CVE 524	Engineering Economics	2	2	-	-
CVE 598	Seminar II	1	-	-	1
CVE 599	Project	4	-	-	4
	Elective	3	3	-	-
	Total	**22**	**13**	**2**	**7**
ELECTIVES					
CVE 510	Bridge Design	3	3	-	-
CVE 512	Advanced Structural Mechanics	3	3	-	-
CVE 514	Transportation systems Planning and Design	3	3	-	-
CVE 516	Waste Management Engineering	3	3	-	-
MCE 522	Engineering Law	2	2	-	

COURSE SYNOPSES

CVE 102: INTRODUCTION TO CIVIL ENGINEERING (1 Unit)

Introduction to various fields of civil engineering; the role of civil engineers in the development of the nation in terms of provision of amenities and problem solving; influence of civil engineers on the environment. Planning of cities and rural settlement. Report writing, engineering presentation of data and technical reviews in various aspects of engineering practice in oral presentation.

CVE 201: ENGINEER IN SOCIETY (1 Unit)

Philosophy of science. History of Engineering and Technology. The role of the engineer in society. The engineers and contract determination. The legal status of COREN and NSE. The responsibilities and liabilities of an engineer. Safety in engineering. Introduction to Risk Analysis

CVE 202: STRENGTH OF MATERIALS (2 Units)

Direct Stress: Hooke's experiment. Axially loaded bar, tensile and compressive stresses. Strain: tensile and compressive strains. Stress-Stain curves for ductile and brittle materials. Modulus of elasticity. Mechanical properties of materials; elastic limits, proportional limit, yield points, ultimate strength. Modulus of toughness.

Percentage reduction in areas. Percentage elongation.
Principal stress: Definition and deductions from Mohr's circle. Mohr's circle method of determining stress and strain. Working stress, proof stress, Poisson's ratio, modulus of rigidity. Factors of safety. Lateral stresses and strains. Bars of varying cross-sections, compound bars under stress and strain. Temperature stresses. Torsion: effects of torsion. Twisting moment. Polar second moments of area. Torsional shearing stresses and strains. Modulus of elasticity in shear. Angle of twist. Rupture.
Shearing force and bending moments. Simply supported beam. Loading forces and moments in beams. Shear and moment equations. Shear force and bending moment diagrams.

CVE 200: STUDENTS' WORK EXPERIENCE PROGRAMME (SWEP) (3 Units)
Students would be attached mainly to the Civil Engineering Unit of the Works and Services Department of the University for the long vacation period. Students would be expected to receive some practical training in the area of building construction, maintenance and repairs.
Detailed report of students experience and activities during the period of attachment would be submitted by the students not later than the first week of the following semester. These records and other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by university and site based supervisors will be used for grading purposes.

CVE 297: SWEP SEMINAR& REPORT (2 Units)
Students would be expected to present a full report of activities in SWEP and make a seminar presentation to the department. Detailed report of students experience and activities during the period of attachment would be submitted by the students not later than the first week of the following semester. These records and other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by university and site based supervisors will be used for grading purposes

CVE 300: STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES I) (3 Units)
Student will be attached to Civil Engineering Construction Works. They would be involved in and expected to receive practical training in any civil engineering activity such as: surveying, wood workshop, block-laying and concreting, building construction, plumbing works, highway/transportation engineering, planning and construction, water supply treatment, pollution control and waste water management. Detailed report of student's experience and activities during the period of attachment would be submitted by the students not later than the first week of the following semester. Grading will be based on the written report, oral presentation in a seminar and on-site assessment by the University and industry-

based Supervisors.

CVE 301: ENGINEERING SURVEYING AND PHOTOGRAMMETRY I (3 Units)
Location and setting out of works; roads, bridges, railways, tunnels, pipelines, buildings. Setting out of simple, compound and reverse curves. Sectioning; longitudinal and cross profiles. Calculation of areas and volumes from contours, spot heights and cross-sections. Curvature correction in earthwork measurements. Chain surveying and compass surveying methods. Contours and their uses; traversing methods and application to leveling. Geodetic leveling error and their adjustment application tacheometry.

CVE 304: HYDRAULICS (3 Units)
Fundamental principles of hydraulics: continuity, energy and momentum. Open channel flows: uniform flow, gradually varied flow. Flow resistance. Manning's and Chezy's equations. Application of the energy, momentum, and continuity equations in combination. Specific energy. Flow in conduits; classification of laminar and turbulent flows. Less inlets, bends, outlets etc. Application of continuity, energy and momentum to closed conduit flow. Pipe systems; reservoir/pipe combinations. Hardy-Cross flow measurements. Simulation of complex flow fields using sources, sinks, uniform flows and doublets and combination of vortices. Steady and unsteady flows in open channels. Dimension analysis and similitude. Hydraulic modeling techniques. Pipe network analysis. Design of reticulation systems. Unsteady flow in pipes with special emphasis on water hammer and the use of surge tanks.

CVE 305: STRUCTURAL ANALYSIS I (3 Units)
Introduction to structural analysis. Degree of statical indeterminacy and stability. Methods of solving determinate beams, frames, arches and trusses. Bending moments and shearing forces. Displacement of beams, pin-jointed frame works, using virtual work method. Influence lines of shearing forces and moments of statically determinate beams and trusses. Moment distribution. Conjugate beams, trusses and three-hinged arches. Analysis of indeterminate structures by virtual work and energy methods. Suspension bridges. Elastic center and column analogy methods. Influence lines for indeterminate structures; influence line diagrams for reactions, shear forces, moments and deflections.

CVE 308: SOIL MECHANICS (3 Units)
Formation of soils. Soil in water relationship – void ratio, porosity, specific gravity and other factors. Soil classification: Atterberg limits – particle size distribution. Flow in soils – seepage and permeability. The modified ASSHTO and West African Standard Compaction. Stabilization of soils with lime, cement bitumen, etc. Consolidation and consolidation settlement. Site investigation. Laboratory and coursework.

CVE 309: CIVIL ENGINEERING MATERIALS (3 Units)

Physical and mechanical properties of specific construction materials, behaviour of materials and structures under load, ferrous and non-ferrous metals (cement, asphalt and wood). Design and manufacture of cement concrete. Surface treatment of concrete. Design and manufacture of Asphaltic concrete. Use of tars, cutbacks, emulsions and bituminous materials in road construction and maintenance works. Use of timber, glass, plastics, asbestos, clay bricks and other materials in construction. Laboratory tests on cement, steel reinforcement, asphalt, tar bituminous materials, wood, bridge, sandcrete blocks, etc.

CVE 311: ENGINEERING GEOLOGY I (3 Units)

Geological structures, earth movements. Rocks and minerals: classification of rocks. Mapping and time scale in geology. Regional geology of Nigeria. Weathering and erosion, their effects on road and bridge construction. Landslides and other crustal displacements; Seismic effects/events; construction condition in seismic areas. Rheological events and their effects on settlement of structures. Earthquake problems. Introduction to rock mechanics; mining engineering; rock excavation, drilling and blasting techniques.

CVE 318: ELEMENTS OF ARCHITECTURE (3 Units)

Introduction – Dimensional awareness, graphic communication, relation with the environments. Free-hand drawing – form in terms of shades, light and shadow. Orthographics: dimetric, perspective projections; applications. Common curves. Elementary designs. Computer-Aided Drawing and Drafting (CADD).

CVE 320: HYDROLOGY (3 Units)

The hydrologic cycle. Precipitation, infiltration, evaporation, evapotranspiration of ground water, surface run-off, floods and draughts. Physical and statistical analyses related to hydrological processes. Flood routing techniques. Hydrologic systems analysis. Hydrographic analysis. Unit hydrograph theory. Occurrence and distribution of water in nature. Hydrogeology, fundamentals of flow in porous media. Equations governing flows in aquifer. Exact approximate solutions. Flows in layered aquifer systems.

CVE 321: STUDIO DESIGN I (2 Units)

Introduction to Computer Aided Drafting (CAD) and detailing (CADD):Electronic draughting packages; principle and use in engineering design. Simulation packages; principle and use in engineering. Drawings of Engineering Structures e.g. Bridges, Dams, Foundations etc. Using electronic packages. The use of engineering survey software.

CVE 324: CIVIL ENGINEERING DRAWING (2units)

Symbols and conventions. Dimensions, notes, titles, working or construction drawing and relation to specifications. Plans: floors. Foundations, framing and roof plans. Sections and details; building sections and section elevations. Drawings and detailing of civil engineering structures e.g bridges, dams, foundations etc. Using electronic Packages/Conventional Methods: Engineering/Drawing. Manual Drawing through the use of T-square and drawing board etc.

CVE 326: STUDIO DESIGN II (2 Unit)

The use of different civil engineering software for the design of foundation, building structures, bridges, dams, retaining walls, water reservoir, steel structures, highways, etc. Advances in civil engineering laboratory and onsite data measurement techniques.

CVE 328: DESIGN OF STRUCTURES I (3 Units)

Design philosophy with regards to elastic design, load factor method and limit state design. Introduction to design Codes or Nigerian code; Design fundamentals – approach, means of evaluation. Regulation, codes of practice. Design of reinforced concrete slabs and yield line theory of slabs. Limit state design of structural elements – slabs, beams, columns, staircases, foundations, etc.

CVE 350: ENGINEERING ENTREPRENEURSHIP I (2 Units)

Development of skills in house painting, carpentry, brick-laying, production of interlocking stones, block-making, plumbing, house electrification, etc. Production of affordable and safe roofing and ceiling sheets.

CVE 400: STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME II (SIWES II) (8 Units)

Students would be attached to Civil Engineering Companies (Construction and Consulting Firms) for internship. They would be expected to receive sufficient practical training in construction and site management and be familiar with contract documents, conditions of contract, technical specification and contract supervision. Students would submit detailed report of experiences and activities during the period of attachment not later than the first week of the following semester. Grading will be based on the written report, oral presentation in a seminar, and on-site assessment by University and industry-based supervisors.

CVE 403: CIVIL ENGINEERING PRACTICE (2 Units)

Nature of civil engineering profession. Relationships in Civil Engineering projects; client, consultant, contractor. Preconstruction planning; preliminary investigations and reporting; Economic justification and cost-benefit ratio. Design calculations. Specification. Preparation of Bills of Engineering Measurements (BEME). Types of contract. Tendering procedure and contract documents. Tenders Board. Award of

contract. Forms of contract Agreement. Contract Administration: contractor programme. Role of Engineer, Duties of Resident Engineer and Site Engineer. Variation orders, Interim payment certificated; Retention money; Final payment certificate; Liquidated damages; Arbitration; Engineer as expert witness; Professional institutions; Professional ethics.

CVE 405: STRUCTURAL ANALYSIS II (3 Units)

Advanced moment distribution methods. Sway effects and modified stiffness methods for multi-bay and multi-storey structures. Ultimate load analysis. Theory of indeterminate arches. Model analysis. Analysis of suspension bridges. Slope-Deflection method of analysis of frames and beams. Shear stress distribution. Stresses in shells and thin cylinders, compound stress. Computer applications in structural analysis and design. Laboratory practical on tensile, compressive and shear stresses.

CVE 415:SOIL MECHANICS II (3 Units)

Mineralogy of soils. Soil structures. Compaction and soil stabilization. Standard proctor compaction. Soil exploration, sampling and in-situ attesting techniques. Bearing capacity, stress distribution and settlement. Design of shallow and deep foundations including pile loading tests and rate of settlements. Single piles, pile group behaviors. Foundation for offshore structures. Pile driving dynamics, cofferdams, bracing and strutting techniques. Field trip to construction sites. Assessment of challenging soils. Load-deformation description of C-ø and challenging soil. Types and analysis of retaining walls. Efficiency of pile groups. Laboratory work.

CVE 417: DESIGN OF STRUCTURES II (2 Units)

Limit state philosophy and design in structural steel works. Basic concepts of elastic and plastic design. Design and detailing of structural steel elements (beams, slabs, columns and foundations) according to current codes of practice. Beam girders and struts/columns. Design of welded and bolted connections in structural steel. Beam-column connection design. Design of steel plate girders. Basic consideration of crane and gantry girders. Introduction to the complete design of industrial/agricultural buildings in structural steel.

CVE 423:ENGINEERING SURVEYING AND PHOTOGRAMMETRY II (3 Units)

Introduction to photogrammetry, elements of photogrammetry equipment, principles and uses. Errors of measurements. Evaluation of single photographs. Further work on contours and contouring, methods of contouring; contour interpolation and uses of contour plans and maps. Areas and volume. Setting out of engineering works. Elementary topographical surveying. Global Positioning System and Geographic Information System (GPS/GIS). Photogrammetry and Hydrographic

surveying. Engineering applications to surveying measurements.

CVE 425: HIGHWAY ENGINEERING I (3 Units)

Soil engineering aspects of highways. Railways, harbours and airfields. Highway geometrics. Pavement structure and design. Pavement materials and laboratory tests. Fundamentals of traffic engineering. Traffic studies and analysis; origin – destination survey and traffic counts. Route surveying and planning. Geometric design of routes (road, railways, tunnels, etc; straight, curved, super-elevation, transition curves, etc).

CVE 501: STRUCTURAL ANALYSIS III (3 Units)

Energy methods in structural mechanics. Matrix methods of structural analysis. Flexibility and stiffness methods of structural analysis. Elastic instability. Limit analysis of frames. Collapse mechanism. Elastic and plastic analysis of frames. Thermal gradients in indeterminate structures. Effect of temperature, pre-strain and support displacement. Plastic Methods of Structural analysis. Continuum of plane strain, elastic flat plates and torsion, solution by series, finite difference, finite element. Yield line Analysis and Strip methods for slabs. Laboratory work.

CVE 502: IRRIGATION AND DRAINAGE ENGINEERING (3 Units)

Planning of surface irrigation scheme. Water study and canal discharge. Depth and frequency of irrigation and rotation of supply. Design and layout of canals, problems of erosion, sedimentation, seepage and other losses, and maintenance; irrigation structures.Methods of soil drainage; surface and sub-surface systems. Open and pipe drainage techniques. Design of drainage layout. Use of drainage in land reclamation. Legislation and agricultural acts. Education and incentives, individual community action. Water user association.

CVE 504: GEOTECHNICAL ENGINEERING (3 Units)

Role of the geotechnical engineer in construction. Physical properties of soils. Factors governing soil formation. Permeability, seepage and filter requirements. Principle of effective stress in soil. Consolidation and settlement calculation. Shear strength of soils. Bearing Capacity of Soils. Slope Stability. Earth Pressures. Tunneling practice. consolidation and settlement. The behavior of rocks and soils in building and engineering construction, foundations: Normal and deep foundations, Use and general characteristics of piles. Pile driving formula. tunnels, dams and flood control works with particular reference to the importance of the mineral composition of earth and rock minerals, their geomorphic and geological features and stress history. Shoreline engineering Site Investigations.

CVE 508: STRUCTURAL DESIGN III (3units)

Limit state design in timber. Design of structural elements in timber and connector. Composite design and construction in steel and reinforced concrete. Cased section and column bases. Design for torsion in steel and reinforced concrete. Design of structural foundations in steel and reinforced concrete. Limit state philosophy of pre-stressed concrete, design for flexure, losses of cable concordance. End-block design of pre-stressed sections. Modern structural design of tall buildings, lift shafts, shear walls, consideration of various structural systems. Design projects in reinforced concrete, structural steel and timber. Introduction to lower and upper bound theory of slabs. Laboratory test on concrete.

CVE 509: ENGINEERING ENTREPRENEURSHIP II (2 Units)

Personnel Management; Business Financing; Starting small-scale businesses; Basic personal accounting; Marketing; Feasibility Studies. Term paper to be written and graded in any relevant engineering topic.

CVE 510: BRIDGE DESIGN (3 Units)

Superstructure and substructure design. Design of simple span and continuous span bridges including slab, beam and truss types. Introduction to orthotropic steel plate deck bridges. Suspension bridges, cable stayed bridges. Design of prestressed concrete bridge decks. Introduction to the finite elements and grillage method of analysis of bridge decks.

CVE 511: CONSTRUCTION PLANTS AND EQUIPMENT (3 Units)

Importance of construction plants in the development of infrastructure. Selection of construction plant and equipment with emphasis on on-site applications, including acquisition, maintenance, utilization, safety in operation, disposal. Plant-hire firms. Basic equipment for emerging economies. Robotics application in modern construction.

CVE 512: ADVANCED STRUCTURAL MECHANICS (3 Units)

Theory of elasticity. Plates in flexure and finite difference methods of structural analysis. Partial differential equations. Thin-stretched membrane and relaxation techniques. Analysis and design of cylindrical shells, polygons, domes and paraboloid.Analysis of plates and shells, frames, columns and plate instability. Design optimization, structural dynamics, structural safety, and similitude in engineering. Beams on elastic foundations, piled structures.

CVE 513: EMBANKMENT DAM ENGINEERING (3 Units)

Principles of analysis and design for earth and rock fill dams: Materials, construction methods, internal and external; Stability, seepage and drainage; Performance monitoring. Reservoir design studies.

CVE 514: TRANSPORTATION SYSTEM PLANNING & DESIGN (3 Units)

Application of operations research and system analysis techniques to transportation systems (passenger and freight). Network flows. Routing and scheduling technology selection; Terminal operation. Techniques for design of transportation systems including networks of fixed facilities and route networks. Time saving improvements. Use of low-capital cost options and the role of demonstration projects. Evaluation of alternative designs.

CVE 515: ENGINEERING PROJECT MANAGEMENT (2Units)

Management of engineering projects. Formation of company; Sources of finance, money and credit. Insurance, National polices, GNP growth rate and prediction. Organizational management-selection, recruitment and training. Job evaluations. Industrial psychology –individual and group behavior. The learning process, and motivation factors. Resource management. Materials Management: Purchasing methods. Contracts. Interest formula. Rate of return. Planning and decision-making. Forecasting scheduling. Production control. Gant chart. CPM and PERT. Optimization methods. Transport and materials handling. Work study and production processes.

CVE 516: WASTE MANAGEMENT ENGINEERING (3 Units)

Quantity and quality of wastewater including parameters for the determination of quantity and qualities. Planning, design and constructions of wastewater treatment plants. Treatment of wastewater: physical, chemical and biological processes; including activated sludge and trickling filters. Sludge treatment and disposal. Land treatment of wastewater using aerated lagoon and anaerobic ponds. Wastewater disposal methods including water dependent and water-independent methods. Pollution in rivers, lakes oceans and water bodies. Organizations and regulations controlling wastewater management. Water quality and health.Industrial wastewater management, nature of industrial wastes, classification, treatment. Significance of SO2. Industrial effluent types and characteristics.

CVE 519: NUMERICAL METHODS IN STRUCTURAL ENGINEERING (3 Units)

Numerical techniques for structural and geotechnical engineering such as residual, variational, finite-difference, finite element and boundary element methods. Selected numerical analysis topics and solution algorithm. Application to 1-D, 2-D, and 3-D structural system.

CVE 520: TRANSPORTATION ENGINEERING (3 Units)

Coordination of all Transportation Media. Transportation Planning and Economics. Geometric Design. Construction Methods. Modes and types of transportation systems; land and railway engineering, air transportation engineering, water

transportation systems. Special characteristics of road, railways, water and air transportation. Docks and Harbors, Inland waterways. Transport demands. Design and maintenance of earthworks for bridges, tunnels, and roads. Materials and Laboratory Tests.

CVE 523: HIGHWAY ENGINEERING II (3 Units)

Highway planning: survey, data collection and analysis. Highway location, design and economics. Traffic studies. Design of traffic control and signals. Traffic safety and management. The importance of bridges and tunnels in the design of highway. Parking facilities. California bearing Ratio (CBR) method extended to airports. Portland Cement Association method for rigid airport pavements. Hill road geometrics, construction and drainage. Administration and finance of highways.. General road maintenance. Construction materials, construction and maintenance. Flexible, rigid and composite pavement designs. Construction of asphaltic and cement concrete pavements. Pavement failures, maintenance overlays. Laboratory tests on highway materials.

CVE 524: ENGINEERING ECONOMICS (2 Units)

Principles of motion economy. Ergonomics in the design of equipment and process. Financial Management: Accounting methods. Financial statement. Elements of costing. Cost planning and control. Budget and Budgeting control. Cost reduction programmes. Depreciation accounting, valuation of assets. Selection of transport media for finished goods, raw materials and equipment. Methods of economic evaluation. Selection between alternatives. Tendering evaluation and contract administration.

CVE 525: WATER RESOURCES ENGINEERING (3 Units)

Source selection: rivers/streams, groundwater, rainwater harvesting. Water uses – industrial, municipal, domestic etc. Water demand projection. Water treatment plants, types. Water quality and water quality standards (WHO). Techniques for aeration, settling tanks, filtration etc. Water storage, water distribution and problems. Design of various water treatment plant units. Appurtenances. Maintenance of water supply systems. Design of water treatment plant. The hydraulics of open channels and wells. Drainage. Hydrograph analysis. Reservoir and flood routing. Hydrological forecasting. Hydraulic structures; dykes, dykes/levees, weirs, docks and harbours, spillways, stilling basins, manholes and coastal hydraulic structures, etc. Engineering economy in water resources planning. EIA of dams, hydroelectric power station and irrigation. Field trips and laboratory practicals.

CVE 527: ENVIRONMENTAL ENGINEERING (3 Units)

Sanitation and the sanitary engineer. Water supply, treatment and design. Waste water collection, treatment, disposal and design. Solid waste collection, treatment, disposal and design of systems, viz. – mechanical compaction, incineration, pyrolisis,

composting, sanitary landfill, recycle and re-use. Solid Waste Management: Properties of solid water, quantity and qualities determination, collection, transportation and disposal methods (sanitary land fills, incineration and compositing open dumping). Leachate and its control in sanitary landfill. Organizations and regulations controlling collection, management and disposal.Air pollution and control: effects on the atmosphere, humans, animals and plant life; effects on economic materials and structures. Laboratory practical on the handling of waste products.

CVE 529:TEROTECHNOLOGY (2units)

Salvaging of Structures, repairs, maintenance and demolition. Evaluation of Building performance. Rules in terms of safety during construction of engineering structures, Fire safety in buildings and other civil engineering structures. Safety precautions and methods for demolition of structures, case studies and assignments.

CVE 597: SEMINAR I (1 Units)

Each student is expected to carry out a significant design project in Civil Engineering under the supervision of an academic staff or a supervisory panel of academic staff. The student is expected to make an oral presentation at a proposal (pre-data) seminar on the project topic.

CVE 598: SEMINAR II (1 Units)

Each student is expected to carry out a significant design project in Civil Engineering under the supervision of an academic staff or a supervisory panel of academic staff. The student is expected to make an oral presentation at a proposal (post-data) seminar on the project topic.

CVE 599: PROJECT (4 Units)

The final year project could be directed at solving an identified problem related to Civil Engineering. The project may originate from staff, students, or external sources. They may have a diverse nature and serve diverse needs. Multi-disciplinary projects are encouraged. A final report on the research project should be compiled, typed and bound in a format designed by the department. The seminar presentation, the project reports, and the student's performance at a viva-voce defence before a panel of internal and external examiners will be used in different degrees in the assessments of the students' projects.

DEPARTMENT OF ELECTRICAL/ELECTRONICS ENGINEERING

Philosophy

The philosophy of the department of Electrical/Electronics engineering is to produce skilled manpower who understand the fundamentals and principles of the discipline, and who can generate technologies for the nation's development as well as agricultural and technological advancement. We desire to produce graduates of high academic standard with adequate background and of immediate value to the industry and nation in general.

Students will be equipped with requisite skill and broad knowledge in both theory and practical aspect of concepts of electrical and electronics engineering such as the rudiments of power systems, renewable energy sources, the art of electronics and automatic control, communications principles and computer applications. Such training will lead to the production of skilled and manpower that is adequately furnished with current and comprehensive knowledge to undertake researches in electrical and electronic engineering that would be self-employed by virtue of service rendering, as well as veritable asset for power, telecommunications, and industrial sectors. This will impact in no small measure on the socio-economic growth and development of the nation.

Objectives of the programme

I. To train students to have competence in the development of ideas and concepts for the solution of engineering problems using divergent and inductive reasoning of electrical and electronics principles and applications to solve societal engineering problems;

Ii. To train students with appropriate technology to be economic self-reliant and be of creative minds;

Iii. To train students on how to use appropriate technology to develop the nation's information and communication technology base;

Iv. To train students to be of requisite skill and competence to meet the demand of manpower for the nation economic growth;

V. To train students on how the use of electrical and electronics principles and techniques for the provision of services that modern agricultural services required;

Vi. To expose students to every aspects of the discipline through carefully designed and well-tailored practical's and supervised projects in the laboratories.

Academic staff

Name	Qualification	Specialization	Designation
I. A. Adejumobi	B. Eng., M. Eng. Ph.D. (Ilorin)	Power Systems and Electrical Machines. MNSE, R. Eng. (COREN)	Professor & Head of Department
O. A. Akinola	B. Eng. (Ado-Ekiti), M. Eng. (Ilorin), MBA (Ado-Ekiti), MNSE. R. Eng. (COREN), Ph.D.	Control, Computer & Electronics	Senior Lecturer
K. A. Amusa	B. Eng. (Ilorin), M.Sc. (Lagos), Ph.D. (Abeokuta) MNSE, R. Eng. (COREN)	Electromagnetics and Communication Systems	Lecturer I
J. F. Orimolade	B. Eng., M.Sc. (Zaria) MNSE, R. Eng. (COREN), Ph.D	Telecommunications and Information Technology	Lecturer I
O. O. Nuga	B. Tech (Ogbomoso), M.Sc. (Lagos), MIET	Controls and Instrumentation	Lecturer I
O. I. Adebisi	B. Eng., M. Eng., Ph.D. (Abeokuta)	Power systems and Electrical machines	Lecturer II
F. A Opeodu	M.Sc., (USSR)	Power SystemNetwork and Machines	Lecturer II
A. J. Olanipekun	B. Eng. (Ado-Ekiti),M. Eng. (Abeokuta), MNSE	Electronics & Communication Systems Engineering	Lecturer II

COURSE OUTLINE

100 Level: First Semester

Course Code	Course Title	U	L	T	P
GNS 101	Use of English	2	2	-	-
GNS 111	Introduction to Social Problems	1	1	-	-
MCE 101	Introduction to Engineering Drawing	2	1	-	1
CHM 101	Physical Chemistry	3	2	1	-
CHM 191	Practical Chemistry I	1	-	-	1
MTS 101	Algebra	3	2	1	-
MTS 103	Vectors and Geometry	2	2	-	-
PHS 101	General Physics I	3	2	1	-
PHS 191	Physics Laboratory I	1	-	-	1
MCE 103	Introduction to Mechanics I	1	1	-	-
GNS 102	Introduction to Nigerian History	1	1	-	-
GNS 203	Use of Library	1	1	-	-
Total		**21**	**15**	**3**	**3**

100 Level: Second Semester

Course Code	Course Title	U	L	T	P
ELE 102	Introduction to Electrical & Electronics Engineering	1	1	-	-
ABE 106	Elementary Fluid Flow	1	1	-	-
CHM 102	Introductory Organic Chemistry	2	2	-	-
CHM 104	Introductory Inorganic Chemistry	2	2	-	-
CHM 192	Practical Chemistry II	1	-	-	1
MTS 102	Calculus and Trigonometry	3	2	1	-
MTS 104	Mechanics	3	2	1	-
PHS 102	General Physics II	3	2	1	-
PHS 192	Physics Laboratory II	1	-	-	1
STS 102	Introduction to Statistics	2	2	-	-
Total		**19**	**14**	**3**	**2**

200 Level: First Semester

Course Code	Course Title	U	L	T	P
ABE201	Engineering Drawing I	2	1	-	1
CVE 201	Engineer in Society	1	1	-	-
MCE 201	Engineering Mechanics I	2	2	-	-
MCE 203	Engineering Materials	3	2	1	-
MCE 205	Fluid Mechanics I	3	2	1	-
ELE 201	Applied Electricity I	2	2	-	-
ELE 203	Fundamentals of Information and Communication Technology	2	1	-	1
ELE 291	Applied Electricity Laboratory I	1	-	-	1
CSC 201	Introduction to Computer Sciences	3	2		1
GNS 201	Writing and literary appreciation	1	1	-	-
MTS 201	Mathematical Foundations	3	2	1	-
Total		**23**	**16**	**3**	**4**

200 Level: Second Semester

Course Code	Course Title	U	L	T	P
ABE 202	Engineering Drawing II	2	1	-	1
ABE 204	Workshop Practice	2	1	-	1
CVE 202	Strength of Materials	2	2	-	-
ELE 202	Applied Electricity II	2	2	-	-
ELE 292	Applied Electricity Laboratory II	1	-	-	1
MCE 202	Engineering Mechanics II	2	2	-	-
MCE 204	Engineering Thermodynamics	3	2	-	1
MTS 232	Ordinary Differential Equations	2	2	-	-
GNS 204	Logic and History of Science	2	2	-	-
GNS 206	Peace and Conflict Resolution	2	2	-	-
ETS 206	Entrepreneurial Studies & Change Management	2	2	-	-
Total		**23**	**18**	**-**	**4**

300 LEVEL: FIRST SEMESTER

Course Code	Course Title	U	L	T	P
ELE 301	Electric Circuit Theory I	3	2	1	-
ELE 303	Electromagnetic Field Theory I	3	2	1	-
ELE 305	Electromechanical Devices & Machines I	3	2	1	-
ELE 307	Electronic Circuits I	3	2	1	-
ELE 309	Physical Electronics	3	2	1	-
ELE 311	Numerical Methods in Electrical & Electronic Engineering I	2	2	-	-
ELE 391	Circuits and Electronic Lab I	2	-	-	2
ELE 393	Electrical Machine Lab I	1			1
MCE 341	Engineering Mathematics I	3	2	1	-
Total		**23**	**14**	**6**	**3**

300 Level: Second Semester

Course Code	Course Title	U	L	T	P
ELE 302	Electric Circuit Theory II	3	2	1	-
ELE 304	Electromagnetic Field Theory II	3	2	1	-
ELE 306	Electromechanical Devices & Machines II	3	2	1	-
ELE 308	Electronic Circuits II	3	2	1	-
ELE 310	Numerical Methods in Electrical & Electronic Engineering II	2	2	-	-
ELE 342	Engineering Mathematics II	3	2	1	-
ELE 392	Circuits and Electronic Lab II	2	-	-	2
ELE 394	Electrical Machine Lab II	1	-	-	1
ELE 350	Engineering Entrepreneurship	2	2	-	-
Total		**22**	**14**	**5**	**3**

400 LEVEL: FIRST SEMESTER

Course Code	Course Title	U	L	P	T
ELE 401	Electric Power Principles	3	2	1	-
ELE 403	Servomechanism and Control Theory	3	2	1	-
ELE 405	Communication Principles	3	2	1	-
ELE 407	Measurements and Instrumentation	3	2	1	-
ELE 409	Power Electronics	3	2	1	-
ABE 443	Statistics for Engineers	3	2	1	-
ELE 491	Instrumentation & Control Laboratory	2	-	-	2
ELE 493	Communications Laboratory	1	-	-	1
ABE 413	Engineering Communication	2	1	1	-
	TOTAL	23	13	7	3

400 LEVEL: SECOND SEMESTER

Course Code	Course Title	U	L	T	P
ELE 200	Students' Work Experience Programme (SWEP)	3	-	-	3
ELE 297	SWEP Seminar & Report	2	-	-	2
ELE 300	Students' Industrial Work Experience I (SIWES I)	3	-	-	3
ELE 397	SIWES I Seminar	2	-	-	2
ELE 400	Students' Industrial Work Experience II (SIWES II)	8	-	-	8
ELE 497	SIWES II Report &Seminar	2	-	-	2
Total		**20**	**-**	**-**	**20**

500 LEVEL: FIRST SEMESTER

Course Code	Course Title	U	L	T	P
CVE 509	Engineering Entrepreneurship	2	2	-	-
ELE 501	Control Engineering I	3	2	1	-
ELE 503	Digital Signal Processing	3	2	1	-
ELE 525	Advanced Circuit Te chniques	2	2	-	-
ELE 527	Advanced Computer Programming & CAD	3	2	-	1
ELE 597	Seminar I	1	-	-	1
	Electives (2)	6	6	-	-
TOTAL		**20**	**16**	**2**	**2**

ELECTIVES

CODE		U	L	T	P
	TELECOMMUNICATIONS ENGINEERING				
ELE 507	Communication Systems	3	2	1	-
ELE 509	Digital communications system	3	2	1	-
ELE 521	Optical Electronics	3	2	1	-
	ELECTRONIC AND CONTROL ENGINEERING				
ELE 505	Power Electronics and Devices	3	2	1	-
ELE 515	Control Engineering II	3	2	1	-
ELE 517	Instrumentation Engineering	3	2	1	-
ELE 519	Electronic Materials Technology	3	2	1	-
	ELECTRICAL MACHINES ENGINEERING AND POWER SYSTEMS				
ELE 505	Power Electronics and Devices	3	2	1	-
ELE 511	Power System Engineering	3	2	1	-
ELE 513	High Voltage Engineering and Switchgear Technology	3	2	1	-
ELE 523	Industrial Electronics	3	2	1	-

500 LEVEL: SECOND SEMESTER

Course Code	Course Title	U	L	T	P
MCE 522	Engineering Law	2	2	-	-
ELE 502	Reliability and Maintainability of Electronic and Electrical Systems	2	2	-	-
ELE 504	Micro-computer Hardware and Software Technique	3	2	1	-
ELE 506	Electrical Services and Energy Utilization	3	2	1	-
ELE 598	Seminar II	1	-	-	1
ELE 599	Project	4	-	-	4
	Electives (2)	6	6	-	-
TOTAL		**21**	**14**	**2**	**5**

ELECTIVES

Course Code	Course Title	U	L	T	P
	TELECOMMUNICATIONS ENGINEERING				
ELE 508	Telecommunications E ngineering	3	2	1	-
ELE 510	Telecommunications Services Design	3	2	1	-
ELE 522	Photonic Devices and Applications	3	2	1	-
	ELECTRONIC AND CONTROL ENGINEERING				
ELE 516	Control Engineering III	3	2	1	-
ELE 518	Dynamic Systems Simulation	3	2	1	-
ELE 520	Very Large Scale Integration Device Physics and Technology	3	2	1	-
ELE 522	Photonic Devices and Applications	3	2	1	-
	ELECTRICAL MACHINES ENGINEERING AND POWER SYSTEMS				
ELE 512	Power Systems Communication & Control	3	2	1	-
ELE 514	Electromechanical Devices Design	3	2	1	-
ELE 518	Dynamic Systems Simulation	3	2	1	-

COURSE SYNOPSES

ELE 102: INTRODUCTION TO ELECTRICAL & ELECTRONIC ENGINEERING (1 Unit)
Definition of Electrical and Electronic Engineering, various options (branches): Power, Electrical Machines, Solid State Electronics, Measurement and Instrumentation, Control and Servomechanism, Computer Systems, Communication Systems, Digital signal Processing, Optical Fiber Systems etc. Introduction to some modern day Electrical & Electronics Technology and how the various branches (options) contribute to them; Internet Technology, Wireless technologies (GSM,CDMA, WiFi, WiMAX, UMTS etc.), Multi-media technologies

(MP3, MP4, VCD, DVD etc.), Factory process control technology etc. Job prospects for Electrical & Electronic Engineers.

ELE 201: APPLIED ELECTRICITY I (2 Units)

Foundation of electric circuit theory: circuit elements (resistor, capacitor and inductors). Network theorems: Kirchhoff's laws, Thevenin, Norton and Superposition theorems. Introduction to electrostatics and capacitance, Transient response in RC, RL and RLC circuits, Elementary discussion of semiconductors: PN junction diode, NPN and PNP transistors, Full wave and half wave rectification circuits and smoothing circuits. Electric lamps and illumination.

ELE 203: FUNDAMENTALS OF INFORMATION & COMMUNICATION TECHNOLOGY (ICT) (2 Units)

Basic computer applications: Microsoft Word, Power Point, Corel Draw, excel, Access. Basic concepts of Information and Communication technology. Internet application: Email, web browsing, introduction to website design and hosting. Data communication systems. Networking (LAN, MAN, WAN). Network design and implementation: network standards/model, network topology, network hardware and software configurations.

ELE 202: APPLIED ELECTRICITY II (2 Units)

Magnetic field of current in space: magnetic flux and flux density, cock screw rule, solenoid and magneto motive force, magnetic circuit inductance. Periodic wave forms: average and effective values characteristics, characteristics and use of non-linear elements in simple circuits. Single phase alternating current circuits: complex impedance and admittances, phasor diagrams, series and parallel resonant circuits. Introduction to electric generators, motors and transformers, power factor correction. Introduction to measuring instruments: moving coil instruments, oscilloscope, electrostatic voltmeter, AC and DC bridges**.**

ELE 291: APPLIED ELECTRICITY LABORATORY I (1 Unit)

Selected experiments on topics related to Applied Electricity I: Current, Voltage, Resistance, and Ohm's Law. Resistor Networks: series and parallel. Network Theorems: Superposition theorem, Thevenin Theorem, Norton theorem. Power, Capacitors and capacitance (series and parallel), Electromagnetic Induction

ELE 292: APPLIED ELECTRICITY LABORATORY II (1 Unit)

Selected experiments on topics Applied Electricity II: RMS value of an AC waveform, Resistive circuit at AC, Capacitive circuit at AC, Inductive circuit at AC, Capacitive reactance, Inductive reactance, Series RC circuit, Impedance of a series RC circuit, Impedance of series RLC circuit, Impedance of parallel RLC circuit.

ELE 200: STUDENTS WORK EXPERIENCE PROGRAMME (SWEP) (3 Units)

Students would be attached mainly to the Electronics and Electrical Engineering Unit of the Works and Services Department of the University, Ongoing projects being supervised by the Directorate of Physical Planning with Electronic and Electrical Engineering components, Computer Center of the University and the Electronics and Electrical Engineering Laboratory of the department. Students would submit detailed reports of experience and activities during the period of attachment not later than the first week of the following semester. These records and other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by departmental and site based supervisors will be used for grading purposes.

ELE 297: SWEP SEMINAR& REPORT (2 Units)

Students would be expected to present a full report of activities in SWEP and make a seminar presentation to the department. Detailed report of students experience and activities during the period of attachment would be submitted by the students not later than the first week of the following semester. These records and other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by university and site based supervisors will be used for grading purposes

ELE 301: ELECTRIC CIRCUIT THEORY I (3 Units)

Frequency response of networks. Poles and zeroes, Bode plots and root locus concept. Two-port networks, ladder networks and electric filters.

Node, loop and cut-set analysis of linear networks. Network graph theory and applications. Periodic non-sinusoidal currents and linear circuits.

ELE 302: ELECTRIC CIRCUIT THEORY II (3 Units)

Some properties of three-phase systems; balanced delta and wye connected loads. Delta-wye transformation. Unbalanced delta and wye connected. Operational methods of transient analysis of lumped network. Laplace transforms and analysis of RLC circuits, transfer functions concepts and reliability of transfer functions. Forster and cauer methods of synthesis of 2-port networks. Active filters. Fourier transforms of non-linear a.c circuits.

ELE 303: ELECTROMAGNETIC THEORY I (3 Units)

Electrostatic fields due to distribution of charge, magnetic fields in and around current carrying conductors. Review of electromagnetic laws in integral form; Gauss' Law' Ampere's and Laplace equations and methods of solution. Boundary value problems.

ELE 304: ELECTROMAGNETIC THEORY II (3 Units)

Maxwell's equation (in rectangular co-ordinates and vector-calculus notation) and its applications. Derivation of Maxwell's equation; electromagnetic potentials and waves. Plane waves and plane wave propagation. Electromagnetic waves and electromagnetic wave propagation in bounded and unbounded media. Poynting vector, boundary conditions; wave propagation in good conductors, skin effect, fundamentals of transmission lines, wave-guides and antennae.

ELE 305: ELECTRICAL MACHINES I (3 Units)

Transformers- Coupled circuits, air cored transformers, equivalent circuits. Iron cored transformers, equivalent circuits. Referred impedance, no-load test, short-circuits test and efficiency of single phase transformers. Three phase transformers. Group connection of windings, auto transformers, Instrument transformers. D.C Machines- Armature winding, principle of commutation. Torque and emf-expressions. Generator and motor configurations. Characteristics of series, shunt and compound wound motors. Speed control and electric breaking, cross field machines. Commutator machines.

ELE 306: ELECTRICAL MACHINES II (3 Units)

Asynchronous (Induction) Machines- Magnetic flux, distribution of induced emf, equivalent circuit, power balance, and equivalent circuit referred to stator. Torque-slip characteristics for generating and motoring actions. The circle diagram. Methods of starting and speed control. Double cage induction motor. Single phase motors. Synchronous Machines- Synchronous machines theory. Equivalent circuit and phasor diagrams for cylindrical rotor. Effect of change in excitation, the V-characteristics with regards to transmission lines. Short-circuit analysis of synchronous machine, d-, q-axis analysis of salient pole machines.

ELE 307: ELECTRONIC CIRCUITS I (3 Units)

Review of 2-port network theory applied to transistor circuits. Transistor characteristics (Bipolar and FET). Analysis of single and multistage transistor amplifiers, frequency response analysis. Power amplifiers: Class A, B, C and push-pull amplifiers. Feedback amplifiers. Oscillators. Introduction to operational amplifiers. Stabilized power supplies. Use of electronic devices in voltage regulation. Review of elementary digital concepts, switching properties of electronic devices.

ELE 308: ELECTRONIC CIRCUITS II (3 Units)

Switching and wave shaping circuits. Generation of non-sinusoidal waveforms: astable, monostable and bistable multivibrators. Timer chips and their applications. Analysis and design of logic gates of various families, diode logic, RTL, TTL, ECL, MOST. Introduction to basic logic functions: AND, OR, NOT etc. Boolean algebra,

simple logic circuits. Minimization of logic functions, k-map. Sequential circuits, RS, JK, DT. Flip-flop, registers, counters and decoders. Introduction to D/A and A/D conversion principles.

ELE 309: PHYSICAL ELECTRONICS (3 Units)

Elementary physical electronics: Crystal structure, electron and energy band schemes in conductors, insulators and semiconductors. Electrons in metals and electron emission. Carriers and transport phenomena and photo devices, junction diodes and transistors, FETS, SCR, vacuum tubes, photo-resistors, solar cells, photo-diodes, photo-transistors, photo-cells and LEDs, LASERS etc. Elementary discrete devices fabrication techniques and IC technology.

ELE 311: NUMERICAL METHODS IN ELECTRICAL AND ELECTRONIC ENGINEERING I (2 Units)

Introduction to basic concepts in numerical analysis for engineering problems: Mathematical modelling, Types of models (linear, non-linear, deterministic, probabilistic, static, dynamic, homogeneous, heterogeneous etc.), Solution methods to problems in engineering (closed-form method, analytical method, numerical method). General application areas of numerical methods, Applications of numerical methods in Electrical and Electronics engineering. Algorithms and flowcharting, Matrices concepts, Numerical method of solution of linear equations: Gaussian Elimination method, Gauss-Jordan method, Gauss-Seidel Iteration method.

ELE 312: NUMERICAL METHODS IN ELECTRICAL AND ELECTRONICS ENGINEERING II (2 Units)

Numerical method of solution to non-linear equations: Bisection method, Newton-Raphson method. Numerical method of solution of ordinary differential equations: Trapezoidal rule, Simpson's rule, Euler's method, Runge-Kutta's method. Numerical method of solution to partial differential equation: Finite difference method, Finite element method, Method of moments.

ELE 342: ENGINEERING MATHEMATICS II (3 Units)

Solution of ordinary differential equations, Curve fitting, Simple linear programming, Fourier series – Euler coefficients, even and odd functions, sine and cosine functions, simple applications. Gama, Beta and probability functions. Differential equation of second order – series solutions. Legendre and Bessel functions and their properties. Complex variables – advanced topics, differentiation and integration of complex functions. Cauchy – Riemann equations: Related theorems: Laplace and Fourier transform – Applications Introduction to non-linear differential equations – stability and Applications.

ELE 350: ENGINEERING ENTREPRENEURSHIP (2 Units)

Definition of entrepreneur, attitude, characteristics and skills of entrepreneur,

sources of fund and materials for entrepreneur, Types of enterprises (Sole proprietor, partnership, limited liability etc., Entrepreneurship in Electrical Electronic Engineering.

ELE 391: CIRCUITS AND ELECTRONIC LABORATORY I (2 Units)
Experiments involving power at AC, series resonance, parallel resonance, transformer, semiconductor diode, half-wave rectifiers and full-wave rectifiers.

ELE 392: CIRCUITS AND ELECTRONIC LABORATORY II (2 Units)
Experiments involving Zener diode, familiarization with transistor configurations: CE, CC and CB; silicon controlled rectifier (SCR), TRIAC, Trigger devices: DIAC and UJT, Field effect transistors.

ELE 393: ELECTRICAL MACHINE LABORATORY I (1 Unit)
Selected experiments on Transformer, Measuring the winding resistances (Low voltage and High voltage), No-load Test, Short Circuit Test, Measuring the transformation ratio (step up and step down), DC Machine , Measurement of winding resistance in Shunt Excitation DC Generator, Series Excitation DC Generator, Compound Excitation DC Generator, Resistance of series excitation winding of Compound DC Generator, Resistance of the shunt excitation of winding of Compound DC Generator

ELE 394: ELECTRICAL MACHINE LABORATORY II (1 Unit)
Selected experiments on Three Phase Synchronous Machine, Measurement of resistance of the armature winding, Measurement of the resistance of the excitation winding, AC Asynchronous Machine Laboratory, Measuring winding resistance Measurement of Slip Ring Motor Transformation Ratio, No-load Test Experiment, Short Circuit Test.

ELE 397: SIWES I SEMINAR& REPORT (2 Units)
Students would be expected to present a full report of activities in SIWES I and make a seminar presentation to the department. Detailed report of students experience and activities during the period of attachment would be submitted by the students not later than the first week of the following semester. These records and other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by university and site based supervisors will be used for grading purposes

ELE 401: ELECTRIC POWER PRINCIPLES (3 Units)
Power sources. Principles and methods of energy conversion employing steam, gas, water, nuclear, wind and magneto hydrodynamic generation. Design and organization of power stations. Sitting of power station. Power station auxiliaries. Components of power generating system. Prime mover systems, generators,

characteristics, equivalent circuits, control and operation. Voltage regulation. Economics of power generation. Supply system, transmission and distribution systems, rated voltages and frequency. Substations; types, switch-gear and bus bar structures.

ELE 403: SERVOMECHANISM AND CONTROL (3 Units)

Control system concept: open and closed loop control systems, block diagrams. Resume of Laplace transform. Transfer functions of electrical and control systems. Electromechanical devices: Simple and multiple gear trains, electrical and mechanical analysis. Error detector and transducer in control systems. The amplidyne: AC and DC tachogenerator and servomotors, rotary and translational potentiometers. Hydraulic and pneumatic servomotors and controllers. Dynamics of simple servomechanism. Steady state error and error constants, the use of non-dimensional notations and the frequency response test. Log and polar plots of control systems. Basic stability concepts in control systems.

ELE 405: COMMUNICATION PRINCIPLES (3 Units)

Basic concepts of a communication system – source, channel and user. Signal and systems analysis, Fourier series. Amplitude modulation; double sideband, single sideband and vestigial sideband modulation schemes; simple modulators, power and bandwidth performance. Angle modulation, frequency modulation, phase modulation, bandwidth requirements, clippers and limiters. Wideband and narrowband FM, AM, detector and FM discriminator, frequency tracking loop, phase locked loop and noise performance. Commercial radio systems. Transmission media: attenuation in open space, air, cable and fiber channels. Sampling principles, theorems and techniques. Pulse modulation: PAM, PWM and PCM. Ideal and matched filters, frequency acquisition, phase referencing and timing. Line codes, block encoding and Shannon's theorem.

ELE 407: MEASUREMENTS AND INSTRUMENTATION (3 Units)

Principles of measurements: errors and accuracy – units of measurements, standard symbols for electrical measuring instruments and electrical standards. Basic meter in DC measurement. Basic meter in AC measurement; instruments for direct measurement of current and voltage – moving coil, moving iron, electrodynamic and electrostatic measuring instruments. DC and AC bridges and their applications. Measurement of electrical energy, power, power factor and frequency. Measurement of magnetic field strength. Electronic instruments for the measurement of voltage, current, resistance and other circuit parameters. Principle of the cathode-ray oscilloscope. Introduction to semiconductor device testers, electronic counters and digital meters.

ELE 409: POWER ELECTRONICS (3 Units)

Introduction to power semiconductor components. Power rectifier and circuits;

half-wave, full-wave and three phase full-wave controlled rectifier circuits. Voltage-time area analysis. Single-phase and poly-phase inverter circuits, harmonic analysis. Chopper circuits; types A and B. Four quadrant chopper circuits. D.C. to A.C. converters. Application of power semi-conductor circuits; regulated power supplies, uninterruptible power supplies. Induction healing and relays.

ELE 491: INSTRUMENTATION AND CONTROL LABORATORY (2 Units)

Selected experiments on Introduction Measurements with multimeter at DC and AC Supply . Introduction to Use of Oscilloscope & Signal Generator. Regulation and Control Systems. Analog and Digital Systems. The 741 Operational Amplifiers, Inverting and Non Inverting Amplifiers , Comparators. Working with MATLAB plot function, Sine Wave as a Function of Time , Frequency Response , Frequency Domain Analysis , Step Response of a System. Simulating Control Systems with Simulink and MATLAB , Plotting the Root Locus of a Transfer Function. Servo System Training System, Tachogenerator Output Interface and Armature Voltage Control, Braking Generator/ Braking Load Control.

ELE 493: TELECOMMUNICATION LABORATORY (1 Unit)

Selected Experiments on Amplitude and Frequency Modulation, Optic General Introduction telegraph Communicat Signaling Systems, Morse Code ,Telegraph System. Simple Telephone System,Electric Telephone, Intercom System, Intercom Telephone , Frequency and Volume, Dialing and Telephone Exchanges, Switching Signalslight, Laser And The Optic Fiber, Optical Communication, Wireless Communication, Computer Communication, Rotating Antenna Platform.Digital Exchange.

ELE 497: SIWES II SEMINAR& REPORT (2 Units)

Students would be expected to present a full report of activities in SIWES II and make a seminar presentation to the department. Detailed report of students experience and activities during the period of attachment would be submitted by the students not later than the first week of the following semester. These records and other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by university and site based supervisors will be used for grading purposes

ELE 501: CONTROL ENGINEERING I (3 Units)

Linear control systems. Stability: Nyquist stability criterion. Bode diagram approach; the root locus and root contour method. Design of linear servo systems, Compensation designs using the Body and root locus methods. Multiple loop feedback systems; Minimization of unwanted disturbances. Single and multi-term electronic process controllers. Hydraulic and pneumatic controller; Introduction to analogue and hybrid computation, sensitivity of control systems. A.C. control system. Synchros; suppressed carrier modulation, hybrid AC/DC control systems;

practical considerations in a.c control design.

ELE 502: RELIABILITY AND MAINTAINABILITY OF ELECTRICAL & ELECTRONIC SYSTEMS (2 Units)

Introduction to reliability, maintainability, availability and elementary reliability theory. Application to power systems and electronic components. Test characteristics of electrical and electronic components. Types of fault. Designing for higher reliability. Packaging, mounting, ventilation, protection from humidity and dust.

ELE 503: DIGITAL SIGNAL PROCESSING (3 Units)

Network synthesis reliability of driving point impedance, synthesis of two-terminal networks. Foster Form realization, minimum phase and non-minimum phase networks. Discrete signals and Z-transform, Digital Fourier transform, Fast Fourier Transform. The approximation problem in network theory. Filter design and synthesis. Spectral transforms and their application in the synthesis of high-pass and band-pass filters. Digital filtering, digital transfer function one-dimensional recursive and non-recursive filters, computer techniques in filters synthesis Hardware and software realization of filters. Basic image processing concepts.

ELE 504: MICROCOMPUTER HARDWARE AND SOFTWARE TECHNIQUE (3 Units)

Elements of digital computer design: control units, micro-programming. Bus: organization and addressing schemes. Microprocessors, system architecture bus control instruction, execution and addressing modes. Machine code assembly language and high-level language programming. Microprocessors as state machines, microprocessor interfacing: input/output, technique, interrupt systems and direct memory access: interfacing system development tools: simulators, EPROM programming, assemblers and loaders. Overview of available microprocessor and microcomputer and systems, operating system and compiler. Microprocessor applications.

ELE 505: POWER ELECTRONICS AND DEVICES (3 Units)

Switching characteristics of diodes, transistors, thyristors etc. analysis of diode circuit with reactive loads, analysis of circuits using transistors as switches, power control circuits, AC/DC converters, characteristics of switching transformers, power semi-conductor device protection, examples of power electronic circuits, solar devices.

ELE 506: ELECTRICAL SERVICES AND ENERGY UTILIZATION (3 Units)

Design and organization of power supply: rated voltages and frequency. Types of power consumers and their characteristics. Lighting systems and installation:

Lighting control circuits. Electrical heating: heating of buildings, electrical furnaces, electrical welding, air conditioning and refrigeration. Electro-chemical processes. Motor control for industrial system: General and special factory drives. Regulations on installation and operation of electrical equipment. Metering and tariff systems.

ELE 507 COMMUNICATIONS SYSTEMS (3 Units)

Microwave frequencies and uses; microwave transmission in transmission lines and wave guides, microwave circuits; impedance transformation and matching, microwave circuits; passive microwave devices, resonant and filter circuits, active microwave devices; Klystron and magnetron tubes and semiconductor devices for microwave generation. Antennae: definitions of elementary parameters related to radiation patterns; dipole and aperture antennae and the related design parameters; introduction to antennae arrays. Radiowave propagation: propagation in the ionosphere, troposphere and in stratified media; principles of scatter propagation; applications in general broadcast, television and satellite communication systems. Radar systems nature of radar and radar equations; composition of a radar system; application of different types of radars.

ELE 508: TELECOMMUNICATION ENGINEERING (3 Units)

Introduction to telephony signaling system, Cable telegraphy and telephony characteristics, cross talk, equation, Pole lines, aerial and underground cables. Telegraph systems: codes, radio systems, terminal equipment (teleprinters, relays, switching systems, repeaters). Telephone receivers, switching (crossbar, electronic switches), PBX, PABX, Transmission standards, Telephone network structure. TDM and FDM systems. Introduction to Satellite Communication Systems. Multiple access methods in satellite communication. Earth stations for international telephony and TV. Introduction to Television Engineering, Black and White Television Broadcasting, Colour Television Systems. NTSC, PAL, SECAM, Television Transmitters and Receivers Cable Television Systems, VHF Systems, UHF Systems

ELE 509: DIGITAL COMMUNICATIONS SYSTEM (3 Units)

Block Diagram of digital communication system sampling theorem, Shannon theorem and applications in digital communication system. Advantages of digital signals, Noise in digital system. Filtering and equalization, Digital modulation techniques: FSK, ASK, QPSK, M-PSK, QAM, etc. Error detection and correction techniques, encoders/ decoders. Applications of digital communication system: Satellite communication, telephoning microwave, wireless communication, optical communication, Broadband communication, Internet Technology.

ELE 510: TELECOMMUNICATION SERVICES DESIGN (3 Units)

Telephone installations, PABX installations choice of cables and accessories, Computer networking: choice of cables, installations, accessories, Optical fiber communication system: installations and accessories. Lighting protection

techniques and earthing techniques. Design of microwave links system. Practical antenna systems: L.F, M.F, VHF and UHF antennas. Bill of Engineering material and Evaluation and billing of telecommunication installations

ELE 511: POWER SYSTEMS ENGINEERING (3 Units)

Overhead transmission lines; line parameter (R, L and C) calculations. Equivalent circuits of transmission lines, underground cables, types and parameters. Representation of power systems, power system equation and Analysis, load flow studies, load forecasting, economic operation of power systems, symmetrical components, symmetrical and unsymmetrical faults, various types of relays used in power systems, protection systems of power transmission lines, principles of fault detection, discrimination and clearance, elements of power systems stability. Application of Computer to Power Systems Analysis. Sitting of new generation stations. Station management and maintenance routine

ELE 512: POWER SYSTEM COMMUNICATION AND CONTROL (3 Units)

Review of transmission line theory. High frequency communication on power lines carrier systems and power line carrier applications. Multiplexing, Telemetering, Signal processing and data transmission. Control of power generation, voltage control, system stability, and automatic voltage regulators, regulating transformers.

ELE 513: SWITCHGEAR AND HIGH VOLTAGE ENGINEERING (3 Units)

Generation and measurement of high voltage and current; Breakdown theories for gaseous liquid and solid dielectrics, lightning phenomena, High Voltage equipment, insulation co-ordination, lightning protection, Electric cables and condensers. Earthing, Corona and Radio interference, Propagation of surges in transformers, Means of reducing over voltages.

ELE 514: ELECTROMECHANICAL DEVICES DESIGN (3 Units)

Transient and steady analysis of poly-phase induction motors; equivalent circuits; characteristics and speed control of synchronous machines: steady state analysis, saliency and d-q axis analysis, Matrix equations. Synchronous machines transients: Sudden 3-phase short circuit, transformation to d- and q axes, operational circuit impedance and time constant, model for transient analysis. Synchronous phenomena and sustained oscillators in synchronous machines. Induction machine dynamics and transients: performance during both sudden changes in load and 3-phase fault, models for dynamic analysis, effect of rotor resistance. Paralleling of synchronous machines. Design of transformers, principles of AC and DC machine design, introduction to parks equations.

ELE 515: CONTROL ENGINEERING II (3 Units)

Liapunov stability analysis 1st and 2nd method of Liapunov; stability analysis of linear and non-linear systems using the Liapunov method. Optical control theory and

application controllability and observability. Application of calculus of variation, dynamic programming and pontryagins maximum principles; Time optical control system, optimal systems based on the quadratic performance indices. Minimum time problem minimum fuel consumption problem minimum energy problem. Liapunov second and approach to solution of optimal control problems. Model reference control system introduction to Adaptive control system.

ELE 516: CONTROL ENGINEERING III (3 Units)

Non-linear differential equations. Characteristics of non-linear systems; common non-linearities.

Analysis of non-linear systems: Linearizing approximations, piecewise linear approximation, the describing function concept and derivation for common non-linearities, the duel input and derivation for common non-linearities, the duel input describing function; stability analysis using the plane method function. Limit cycle prediction. The phase plane method construction of phase trajectories, stability analysis by the phase plane method. Introduction to state space analysis: Matrix representation of control systems. Introduction to sample data systems; The z-transforms; pulse transfer function and stability analysis in the z-plane.

ELE 517: INSTRUMENTATION ENGINEERING (3 Units)

Introduction to the design of electronic equipment. Specifications including environmental factors such as vibration, humidity and temperature, Tolerance and safety measures. Reliability and testing. Duplication of least reliable parts (standby). Ergonomic, aesthetics and economics. Miniature and micro-miniature constructor using printed circuits and integrated circuits. Maintainability, computer design methods.

ELE 518: DYNAMIC SYSTEM SIMULATION (3 Units)

Analogue and hybrid computer hardware units. Analogue simulations; Study of Differential equations; Generation of time base reference amplitude and time scaling; simulation of control system from block diagrams, transfer functions and state equations, Analogue memory and its applications, repetitive and iterative operation of an analogue computer. Digital Simulation: Comparison of digital and analogue/hybrid simulation: Block form and expression based languages; interaction; function generation; iterative computation. Hybrid computers: Hardware and software; Assembly routines and interpretive language for hybrid computing; sequential and simultaneous hybrid computing. Special applications, On-line computing processes; Computer techniques for plotting Root-locus, Bode Plots etc., Minimum fuel and regulator problem by hybrid and digital techniques etc. Application program in computer aided design of Electronic and Electrical Systems.

ELE 519: ELECTRONIC MATERIALS TECHNOLOGY (3 Units)

The growth of crystals including epitaxy. Oxidation, diffusion, ion-implantation and

sintering. Photo fabrication, metallization and encapsulation techniques. Passive devices technology including various types of resistors, capacitors and inductors.

ELE 520: VLSI DEVICE PHYSICS AND TECHNOLOGY (3 Units)

Review of semiconductor physics. Junction theory and properties. Bipolar I.C. technology, (including diodes, transistors and passive components). NMOS I.C. technology, (including diodes, transistors and passive components). NMOS I.C. technology, CMOS I.C. technology. Assembly processing and packaging, yield and reliability.

ELE 521: OPTICAL ELECTRONICS (3 Units)

Propagation of plane waves. Optical Fibers. Optical spectra of atoms, molecules and solids. Detectors, and Photo-detectors and noise. Light emitting diodes. Laser fundamentals and Laser diodes. Optical cavities

ELE 522: PHOTONIC DEVICES AND APPLICATIONS (3 Units)

Physics of interaction of photons with solid materials. Physical structures of the following devices and their applications: Photodiodes, LEDs, photo transistors, Photomultiplier tubes, infrared emitters and detectors, solar cells, photo-resistors, light detectors, lasers and optical fibre, protocols, direct links, communication channels, telecommunication links, simplex, duplex and hard duplex, multiplexer, concentrators, computer networks, operating system for online processing, scheduling algorithm, response time, reliability and security.

ELE 523: INDUSTRIAL ELECTRONICS DESIGN (2 Units)

Role of electronics in industries. Power supply and control system. Solid state and switching devices, Photoelectric devices and controls, Counters. Data display and recording. Electric heaters and welders, Radiation Inspection and Detection. Industrial Radio, Industrial Television and Industrial Computers.

ELE 525: ADVANCED CIRCUIT TECHNIQUES (2 Units)

Analysis and design of integrated operational amplifiers and advanced circuits such as wideband amplifiers, instrumentation amplifiers, multiplier circuits, voltage controlled oscillators, and phase locked loops, Design techniques for advanced analogue circuits containing transistors and operational amplifiers. Simulation of circuit using appropriate packages e.g. PSPICE, Electronic
Workbench, Visio technical etc. should be encouraged.

ELE 526: ADVANCED COMPUTER PROGRAMMING & CAD (3 Units)

Numerical iteration procedures, Application programme in computer aided design of Electrical and Electronic systems: MATLAB, C++, C-Sharp, Visual Basic, G-Basic.

ELE 597: SEMINAR I **(1 Units)**

Each student is expected to carry out a significant design project in Electrical Engineering under the supervision of an academic staff or a supervisory panel of academic staff. The student is expected to make an oral presentation at a proposal (pre-data) seminar on the project topic.

ELE 598: SEMINAR II **(1 Units)**

Each student is expected to carry out a significant design project in Electrical Engineering under the supervision of an academic staff or a supervisory panel of academic staff. The student is expected to make an oral presentation at a proposal (post-data) seminar on the project topic.

ELE 599: PROJECT **(4 Units)**

The final year project could be directed at solving an identified problem related to Electrical Engineering. The project may originate from staff, students, or external sources. They may have a diverse nature and serve diverse needs. Multi-disciplinary projects are encouraged. A final report on the research project should be compiled, typed and bound in a format designed by the department. The seminar presentation, the project reports, and the student's performance at a viva-voce defence before a panel of internal and external examiners will be used in different degrees in the assessments of the students' projects.

DEPARTMENT OF MECHANICAL ENGINEERING

Philosophy

The philosophy is to produce a professional in Mechanical Engineering who is concerned with the analysis, design and synthesis of systems such as prime movers, internal combustion engines, and steam and gas turbines, refrigeration and air-conditioning equipment, machine tools, material handling systems, elevators and escalators, industrial production equipment, robots used in manufacturing and interaction between these machines and human elements. Such a professional use the principles of energy, materials, and mechanics to design and manufacture machines and devices of all types and create the processes and systems that drive technology and industry.

Objectives

On successful completion of the programme, such graduate shall be able to:

i. Prepare, read and interpret Engineering drawings.
ii. Develop ideas and concepts for the solution of practical mechanical engineering problems using divergent thinking and induction.
iii. Exercise initiative, judgement and creative ability in the use of engineering principles for the solution of practical engineering problems.
iv. Use appropriate technology to install, operate, maintain and service plant/machinery tools and equipment.
v. Apply management skills to solve a wide scope of management and organization problems related to any Engineering set up.

Academic Staff

Name	Qualification	Specialization	Designation
S. I. Kuye	B. Eng. (Minna), M.Sc., Ph.D. (Lagos), MNSE, R. Eng. (COREN)	Engineering Analysis, Materials and Metallurgy	Senior Lecturer & Ag. Head of Department
M. A. Waheed	B. Eng., M. Eng. (Ilorin), Dr. Eng. Sc. (Aachen), MNSE, R. Eng. (COREN)	Thermofluids and Fluids Mechanics	Professor
S. O. Ismaila	ND (Ilaro), B.Sc. (Ife), M.Sc., Ph.D. (Ibadan), MNSE, R. Eng. (COREN)	Industrial engineering	Professor
O. R. Adetunji	B.Sc., M.Sc. (Ife), Ph.D. (Abeokuta), MNSE, R. Eng. (COREN)	Materials and Metallurgy	Senior Lecturer

NAME	QUALIFICATION	SPECIALIZATION	DESIGNATION
N. O. Adekunle	ND (Ibadan), B. Eng. (Ilorin), M.Sc. (Ibadan), Ph.D (Abeokuta) MNSE, R. Eng. (COREN)	Design and Production	Senior Lecturer
D. O. Okuo	B.Eng. (Akure), M.Eng. (Abeokuta), MNSE, R. Engr. (COREN)	Energy, Thermo-fluids and Environmental Engineering	Lecturer II
B. U. Anyanwu	B.Eng. (Awka), M.Sc (Ibadan), MNSE, R. Engr. (COREN)	Materials and Metallurgy, Mechanical Engineering	Lecturer II

COURSE OUTLINE

100 Level: First Semester

Course Code	Course Title	U	L	T	P
GNS 101	Use of English	2	2	-	-
GNS 103	Introduction to Social Problems	1	1	-	-
MCE 101	Introduction to Engineering Drawing	2	2	-	-
CHM 101	Physical Chemistry	3	2	-	1
CHM 191	Practical Chemistry I	1	-	-	1
MTS 101	Algebra	3	2	1	-
MTS 103	Vectors and Geometry	2	2	-	-
PHS 101	General Physics I	3	2	-	1
PHS 191	Physics Laboratory I	1	-	-	1
MCE 103	Elementary Mechanics	1	-	1	-
GNS 102	Introduction to Nigerian History	1	1	-	-
GNS 203	Use of Library	1	1	-	-
Total		**21**	**15**	2	**4**

100 Level: Second Semester

Course Code	Course Title	U	L	T	P
MCE 102	Introduction to Mechanical Engineering	1	1	-	-
ABE 106	Elementary Fluid Flow	1	1	-	-
CHM 102	Introductory Organic Chemistry	2	2	-	-
CHM 104	Introductory Inorganic Chemistry	2	2	-	-
CHM 192	Practical Chemistry II	1	-	-	1
MTS 102	Calculus and Trigonometry	3	2	1	-
MTS 104	Mechanics	3	2	1	-
PHS 102	General Physics II	3	2	1	-
PHS 192	Physics Laboratory II	1	-	-	1
STS 102	Introduction to Statistics	2	2	-	-
Total		**19**	**14**	**3**	**2**

200 Level: First Semester

Course Code	Course Title	U	L	T	P
ABE201	Engineering Drawing I	2	1	-	1
CVE 201	Engineer in Society	1	1	-	-
MCE 201	Engineering Mechanics I	2	2	-	-
MCE 203	Engineering Materials	3	2	1	-
MCE 205	Fluid Mechanics I	3	2	1	-
ELE 201	Applied Electricity I	2	2	-	-
ELE 203	Fundamentals of Information and Communication Technology	2	1	-	1
ELE 291	Applied Electricity Laboratory I	1	-	-	1
CSC 201	Introduction to Computer Sciences	3	2		1
GNS 201	Writing and literary appreciation	1	1	-	-
MTS 201	Mathematical Foundations	3	2	1	-
Total		**23**	**16**	**3**	**4**

200 Level: Second Semester

Course Code	Course Title	U	L	T	P
ABE 202	Engineering Drawing II	2	1	-	1
ABE 204	Workshop Practice	2	1	-	1
CVE 202	Strength of Materials	2	2	-	-
ELE 202	Applied Electricity II	2	2	-	-
ELE 292	Applied Electricity Laboratory II	1	-	-	1
MCE 202	Engineering Mechanics II	2	2	-	-
MCE 204	Engineering Thermodynamics	3	2	-	1
MTS 232	Ordinary Differential Equations	2	2	-	-
GNS 204	Logic and History of Science	2	2	-	-
GNS 206	Peace and Conflict Resolution	2	2	-	-
ETS 206	Entrepreneurial Studies & Change Management	2	2	-	-
Total		**23**	**18**	**-**	**4**

300 Level: First Semester

Course Code	Course Title	U	L	T	P
MCE 325	Applied Thermodynamics I	2	2	-	
MCE 317	Strength of Materials II	2	2	-	
MCE 323	Fluid Mechanics II	2	2		
MCE 321	Mechanics of Machine I	3	2	-	1
MCE 313	Manufacturing Science & Technology	2	2	-	-
MCE 341	Engineering Mathematics I	3	2	1	-
ELE 305	Electrical Machines I	3	2	1	-
MCE 387	Laboratory Practical I	3	-	-	3
	Total	**20**	**14**	**2**	**4**

300 Level: Second Semester

Course Code	Course Title	U	L	T	P
ELE 342	Engineering Mathematics II	3	2	1	
MCE 316	Introduction to Computer Aided Design and Manufacturing	2	2	-	-
MCE 302	Design of Machine Elements	2	2		-
MCE 318	Engineering Metallurgy I	2	1	1	-
MCE 320	Mechanical Measurement & Control System	2	2		-
MCE 312	Workshop Practice II	2	1		1
MCE 324	Material Science for Engineers	2	2		-
MCE 350	Engineering Entrepreneurship	2	2		
ELE 306	Electrical Machine II	3	2		1
MCE 388	Laboratory Practical II	3	-	-	3
	Total	**23**	**16**	**2**	**5**

400 Level: First Semester

Course Code	Course Title	U	L	T	P
MCE 411	Auto Workshop Practices	2	1	-	1
MCE 413	Technology Policy and Development	2	2	-	-
MCE 415	Heat Transfer	2	2	-	-
MCE 417	Fluid Mechanics III	2	2	-	-
MCE 419	Applied Thermodynamics II	2	2	-	-
MCE 421	Mechanics of Machines II	2	2	-	-
MCE 487	Laboratory Practical III	3	-	-	3
ABE 413	Engineering Communications	2	2	-	-
ABE 443	Statistics for Engineers	3	2	1	-
	Total	**20**	**15**	**1**	**4**

400 Level: Second Semester

Course Code	Course Title	U	L	T	P
MCE 200	Students' Work Experience Programme (SWEP)	3	-	-	3
MCE 297	SWEP Seminar & Report	2	-	-	2
MCE 300	Students' Industrial Work Experience I (SIWES I)	3	-	-	3
MCE 397	SIWES I Seminar	2	-	-	2
MCE 400	Students' Industrial Work Experience II (SIWES II)	8	-	-	8
MCE 497	SIWES II Report &Seminar	2	-	-	2
	Total	**20**	**-**	**-**	**20**

500 Level: First Semester

Course Code	Course Title	U	L	T	P
CVE 509	Industrial Entrepreneurship	2	2	-	-
MCE 501	Production Engineering I	2	2	-	-
MCE 527	Advance Machine Design I	2	2	-	-
MCE 521	Internal Combustion Engines	2	2	-	-
MCE 511	Advanced Computer Aided Design and Manufacturing	2	2	-	-
MCE 587	Laboratory Practical IV	3	-	-	3
MCE 597	Seminar I	1	-	-	1
	Electives (3)	9	9	-	-
	Total	**23**	**19**	**-**	**4**
	Electives				
MCE 503	Refrigeration and Air-conditioning	3	2	-	-
MCE 505	Tribology	3	2	-	-
MCE 509	Mechanical Maintenance	3	2	-	-

Course Code	Course Title	U	L	T	P
MCE 513	Advanced Heat Transfer	3	2	-	-
MCE 515	Corrosion and Wear	3	2	-	-
MCE 517	Automobile Engineering	3	2	-	-

500 Level: Second Semester

Course Code	Course Title	U	L	T	P
MCE 520	Engineering Metallurgy II	2	2		-
MCE 506	Fluid Machinery	2	2	-	-
MCE 532	Engineering Material Selection & Economics	3	3	-	-
MCE 514	Advanced Machine Design II	2	2	-	-
MCE 522	Engineering Law & Management	2	2	-	-
MCE 598	Seminar II	1	-	-	1
MCE 599	Project	4	-	-	4
	Electives (2)	6	6	-	-
	Total	**22**	**17**	**-**	**5**
	Electives				
MCE 502	Production Engineering II	3	3	-	-
MCE 504	Fracture of Structural Materials	3	3	-	-
MCE 508	Power Generating Plant	3	3	-	-
MCE 510	Industrial Engineering	3	3	-	-
MCE 516	Energy Technology	3	3	-	-
MCE 518	Theory of Plasticity	3	3	-	-
MCE 530	Building Services Engineering	3	3	-	-

COURSE SYNOPSES

MCE 101: INTRODUCTION TO ENGINEERING DRAWING (2 Units)

Lettering and line work, Angles, Triangles, Quadrilaterals, inscribing a circle in any regular polygon and inscribing any regular polygon in a circle, Conic sections: drawing the true shape of the section of the frustum of the cylinder. Development of simple engineering/fabricated objects such as: - frustum of cylinder and a pyramid. The ellipse: ellipse by the rectangular method, auxiliary circle method, trammel method and by foci method. Common internal and external tangent to two equal and unequal circles, internal and external arc of a given radii.

MCE 103: INTRODUCTION TO MECHANICS I (1 Unit)

Kinematics; Fundamental Laws of Mechanics, statics and dynamics; work and energy. Simple engineering application

MCE 102: INTRODUCTION TO MECHANICAL ENGINEERING (1 Unit)

Definition of mechanical engineering, various branches; Design; Thermofluids – Thermodynamics, fluid mechanics, Air conditioning & refrigeration. Manufacturing and production – production engineering, machine tools engineering, welding and fabrication. Industrial engineering – Hydraulics and pneumatic engineering, industrial maintenance; Building services; Job prospects.

MCE 201: ENGINEERING MECHANICS I (2 Units)

Independence, dimensions and coordinates in space. Vectors and vector algebra. Forces, couples and their systems: composition, resolution, Varigon's theorem, equivalence and reduction of systems, wrench, rigid bodies and equilibrium. Centers of gravity, centroids and their applications. Structures and machines. Friction, moments of Inertial, virtual work.

MCE 203: ENGINEERING MATERIALS (3 Units)

Atomic and crystal structure. Metallic states. Defect in crystals, conductors, semi-conductors, insulators and super-conductors. The relationship between structure and properties. Alloy theory-application to industrial alloys – steel in particular. Simple phase diagram of alloys. Engineering properties – thermal control, hot and cold working, heat treatment, etc. Creep, fatigue and fracture. Corrosion and corrosion control. Non-metallic materials – glass, rubber, concrete, plastics, wood and ceramics. Elastic and plastic deformations. Materials for cryogenic, corrosive media and nuclear applications.

MCE 205: FLUID MECHANICS I (3 Units)

Elements of fluid statics, density, pressure, surface tension, viscosity, compressibility etc. hydrostatic forces on submerged surfaces due to incompressible fluid. Static forces on surface stability of floating bodies. Introduction to fluid dynamics – conservation laws. Introduction to viscous flows. Fluid friction, friction factor and its relation to pipe losses; pipes in parallel and series. Fluid flow measurements, venturi meter.

MCE 202: ENGINEERING MECHANICS II (2 Units)

Kinematics and Kinetics of particles. Work, energy, power, momentum and impulse. Kinematics and Kinetics of rigid bodies in plane motion. Analysis of elementary dynamic systems – dynamic systems elements: mechanical, electrical, fluid and thermal. Newton's laws of motion. D'Alembert principles and Legrange's equations. Particle dynamics in non-inertial frame of reference.

MCE 204: ENGINEERING THERMODYNAMICS (3 Units)

Definition of terms and general concept of systems, surrounding, process, temperature, heat work and energy. First law of thermodynamics and application to open systems. Second law of thermodynamics and application to heat engines.

Entropy. First and second laws combined. Perfectgases. Joule-Thompson coefficient. Equilibrium processes. Maxwell's relations. Two phase system. Thermodynamic functions of solution. P. V. T – relationship. Work from heat energy. Refrigeration.

MCE 301: MECHANICS OF MACHINES I (3 Units)

Elementary study of machine kinematics and dynamics. Velocity and acceleration diagrams of link mechanisms. Flywheels. Balancing of reciprocating and rotating masses. Gears and gear trains. Governors. Cams and Followers. Gyroscopes.

MCE 303: FLUID MECHANICS II (3 Units)

Introduction, nature and types of fluid. The fluid as a continuum. Physical properties. Scope of fluid mechanics. Units and constants. Fluid statics. Equilibrium of fluid at rest. Thrust on plane surfaces. Buoyance and thrusts on curved surfaces. Integral analysis; control volume and mass conservation, continuity equation in one-dimensional flow; incompressible flow. Basic principles, pressure at a point in a moving fluid. Bernoullis Theorem. Elementary consideration of viscous fluid. Dimensional Analysis: the Pi-theorem. Typical non-dimensional parameters. Dynamic similarity and models. Flow in pipes; entry conditions. The boundary layer concept, laminar and turbulent flows, transition, pressure losses in bends, sudden change of section, pipe fittings and valves. Diffusers, nozzles, branched pipes and flow distribution systems. Flow measurements.

MCE 305: APPLIED THERMODYNAMICS I (3 Units)

Ideal air cycles. Introduction to internal combustion engines; Reciprocating air compressors and other positive displacement compressors. Gas and vapour power cycles; refrigeration cycles; vapour compressor units; principles of absorption and adsorption refrigeration, including solar cooling cycles.

MCE 307: STRENGTH OF MATERIALS II (3 Units)

Consideration of equilibrium, composite members, stress-strain relation. Generalized Hooke's law. Stress and strain transformation equations and Mohr's circle. Shear force and bending stresses in beams. Torsion of circular members. Deflection of beams, revision of methods of solution; shear stress distribution and deflection due to shear center. Unsymmetrical bending. Strain energy methods; application to thin members and indeterminate structures. Helical and leaf springs. Plastic bending of beams, buckling. Thick cylinders; compound cylinders. Rotating disks.

MCE 309: MATERIALS SCIENCE FOR ENGINEERS (3 Units)

Types of Engineering materials; Physical properties of materials; Electrical properties of materials; Mechanical properties of materials; Thermal properties of materials; Chemical properties of materials. Stability of materials in the service environment; Basic metallurgy; Non-metallic materials. Simple stress and strain;

Bending and torsion; deflection of beams: Complex stress and strain.

MCE 313: MANUFACTURING SCIENCE AND TECHNOLOGY (2 Units)

Basic manufacturing industries and processes including casting, forging, assembling, inspection/attesting and certification; packaging, warehousing and forwarding. Metal working operations; shaping, planning, milling, drilling, turning, reaming, broaching, abrasive machining, chip-less machine processes. Metal cutting tools and cutting fluids; cutting forces and power requirement for cutting. Threads, gears, selection of materials; processing methods and equipment for manufacturing. Fabrication methods including welding, soldering, brazing adhesive bonding and mechanical fastening. Heat treatment. Tools for wood-working. Quality control in manufacturing.

MCE 341: ENGINEERING MATHEMATICS I (3 Units)

Linear Algebra – Elements of Matrices, determinants, Inverse of matrix. Theory of linear equations, Eigen-Values and Eigen Vectors. Analytic geometry – Co-ordinate transformation – solid geometry, polar, cylindrical and spherical co-ordinates. Elements of functions of several variables. Vector Theory – Dot product, cross product, divergence, curl and Del operators. Gradient Line, surface and volume integrals and related theorems. The Eigen system problem. Solution of ordinary differential equations – methods of Taylor, Euler, Predictor – Corrector and Runge-Kutta. Use of appropriate software packages (e.g. MATLAB, SYSTAT,etc.) should be encouraged.

MCE 302: DESIGN OF MACHINE ELEMENTS (3 Units)

Design and analysis of individual machine components – shafts, gears, chains, linkages, bearings, keys, keyways, belts, clutches, etc. Component assemblies and machine systems.

MCE 306: COMPUTER AIDED DESIGN AND MANUFACTURING (INTRODUCTION) (2 Units)

Mechanics of movement of living creatures. Mechanics of motion. Elements of Robotics. Sensors and actuators. Introduction to elements of CAD/CAM systems. Principal types of CAD/CAM. The software standardization, identifying company's need for CAD/CAM. Installation and operation of CAD/CAM systems. Role of computers in production and control.

MCE 308: ENGINEERING METALLURGY I (2 Units)

Extractive Metallurgy; Metals, Alloys Production and Uses, Extraction of Metals by Reduction of Metallic Ores. Chemical Metallurgy; Application of Chemical and Thermodynamic Methods and Principle to the treatment of important metallurgical

processes, Classification of extractive metallurgy processes, Physical Metallurgy; Solidification of pure metals, Effect of variables on Structure Solidification as a Nucleation and Growth Process, Solidification of Non-crystalline Materials, Equilibrium Diagrams. Mechanical Metallurgy; Nature, Origin, Control of Structure in Metallic System and their relation to their Mechanical Properties.

MCE 310: MECHANICAL MEASUREMENTS & INSTRUMENTATION (CONTROL) (2 Units)

Basic principles of measurements of mass, linear and angular displacements, velocity, acceleration, force, torque, power, flows, pressure, temperature, strain and stress. Instrument slection, errors and calibration. Elements of instrument systems. Dynamic performance. Primary sensors. Signal processing. Analog and digital recording.

MCE 312: WORKSHOP PRACTICE II (1 Unit)

Continued development of machine shop and tool room practice, as well as continued development of sheet metal and wood working practice.

MCE 314: METALLURGY I (2 Units)

Extractive Metallurgy; Metals, Alloys Production and Uses, Extraction of Metals by Reduction of Metallic Ores. Chemical Metallurgy; Application of Chemical and Thermodynamic Methods and Principle to the treatment of important metallurgical processes, Classification of extractive metallurgy processes, Physical Metallurgy; Solidification of pure metals, Effect of variables on Structure Solidification as a Nucleation and Growth Process, Solidification of Non-crystalline Materials, Equilibrium Diagrams. Mechanical Metallurgy; Nature, Origin, Control of Structure in Metallic System and their relation to their Mechanical Properties.

MCE 401: MECHANICS OF MACHINES II (3 Units)

Vibration of Machinery; free and forced vibration, damping, natural frequencies and critical speeds. Transverse vibration of beams, whirling of shafts, torsional vibrations. Friction in machines (e.g. bearing, clutches etc).

MCE 403: TECHNOLOGY POLICY AND DEVELOPMENT (2 Units)

This course explores and maps alternative approaches to large scale problems of the society. Discussions include government policies as they affect technology. E.g. Antitrust laws, patents, copyrights, legal and economic aspects of pollution, congestion and waste disposal, and private production of public goods, regulation of industries, criteria for public investment, standardization, engineering ethics, and quality assurance.

MCE 405: AUTOMOBILE WORKSHOP PRACTICES (2 Units)

Practical works on Engines and other auto systems; Bodywork techniques; Wheel-

balancing and alignment; Routine maintenance; Fault finding techniques and rectification procedures; Test
and Performance analysis of auto parts and systems.

MCE 407: FLUID MECHANICS III (2 Units)

Kinematics of fluid: Eularian and Lagrangian descriptions. The stream function. Sources, sinks and doublets. Streamline bodies including aerofoils and hydrofoils. Circulation, vorticity and vertices. Irrotational flow and velocity potential. Laminar internal flows, flow through straight channels and covette flow. Very slow motion and lubrication. Turbulent internal flow. Non-circular pipe flow. Piping design. Elements of compressible flow.

MCE 409: APPLIED THERMODYNAMICS II (3 Units)

Gaseous mixtures, combustion, availability, power and refrigeration cycles; internal combustion engines, compressors. Other methods of energy conversion, e.g. fuel cells, thermo-electric generators, magneto hydrodynamics, introduction to plasma state, laser beams.

MCE 200: STUDENTS' WORK EXPERIENCE PROGRAMME (SWEP) (4 Units)

Students would be attached to engineering Sections in the University for the long vacation where they are expected to receive practical engineering knowledge with emphasis on mechanical engineering operations. Detailed report of Students experience and activities during the period of attachment would be submitted by the Students not later than the first week of the following Semester. These records and other factors would be assessed including oral presentation of experience at Students Seminar and on-site assessment.

MCE 297: SWEP SEMINAR & REPORT (2 Units)

Students would be expected to present a full report of activities in SWEP and make a seminar presentation to the department. Detailed report of students experience and activities during the period of attachment would be submitted by the students not later than the first week of the following semester. These records and other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by university and site based supervisors will be used for grading purposes.

MCE 300: STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES I) (4 Units)

Students would be attached to Mechanical Engineering Establishments during the long vacation where they are expected to obtain practical training in mechanical engineering operations.

Detailed report of Students experience and activities during the period of attachment would be submitted by the Students not later than the first week of the following Semester. These records and other factors would be assessed including

oral presentation of experience at Students Seminar and on-site assessment.

MCE 397: SIWES SEMINAR I (2 Units)

Students would be expected to present a full report of activities in SIWES I and make a seminar presentation to the department. Detailed report of students experience and activities during the period of attachment would be submitted by the students not later than the first week of the following semester. These records and other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by university and site based supervisors will be used for grading purposes.

MCE 400: STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES II) (6 Units)

Students would be attached to Mechanical Engineering Establishments where they are expected to obtain in-depth practical training in mechanical engineering operations. These records and other factors would be assessed including oral presentation of experience at Students Seminar and on-site assessment.

MCE 497: SIWES II SEMINAR & REPORT (2 Units)

Students would be expected to be present a full report of activities in SIWES II and make a seminar presentation to the department. These records and other factors would be assessed including oral presentation of experience at a students' seminar and on-site assessment by university and site based supervisors will be used for grading purposes.

MCE 501: PRODUCTION ENGINEERING I (3 Units)

Introduction: The role of production engineering in the mechanical engineering profession. Mechanics and kinematics of machine tools. Tool geometry and chip formation. Mechanics of cutting with single-point tools. Merchant's analysis. Other theories. Economics of cutting. Variables affecting metal removal rate, economic cutting speeds, cutting tool materials, cutting fluids. Principles of metal cutting with multi-point tools: milling, grinding, drilling, boring, etc. Time and cost estimates.

MCE 503: REFRIGERATION AND AIR-CONDITIONING (3 Units)

Fundamental of vapour compression refrigeration. Analysis of refrigeration cycles. Heat pumps. Refrigerants and their properties. Absorption refrigeration. Principles of air-conditioning with emphasis on thermodynamic processes involving air-water-vapour mixture. Elements and design of refrigeration systems. Steady state and transient cooling loads calculations. Design, control and layouts of ventilation and air-conditioning systems. Noise reduction. Principles of application of automatic control elements. Principles of design of cold stores.

MCE 505: TRIBOLOGY (3 Units)

Theories of friction between metallic, non-metallic, dry and lubricated surfaces.

Testing and properties of materials, solid and liquid lubricants. Theory of self-acting and pressurized bearing, including Reynolds equation and solutions. Dynamic loading, temperature and pressure effects on viscosity. Elasto-hydrodynamic lubrication, gears and rolling contact bearings. Design of journal and thrust bearings. Application of tribology.

MCE 507: ADVANCE MACHINE DESIGN I (2 Units)

Philosophy of design. Design as problem solving. Components of design. Creative design. Detail design (quantitative and qualitative). Stress and deflection analysis. Design against failure. Engineering materials. power screws. Detachable fastness. Shafting design. Design project.

MCE 509: MECHANICAL MAINTENANCE (3 Units)

Machine inspection, rate of wear and replacement time prediction. Basic technologies and equipment for repairs of internal combustion engines, pumps and small output power generating plants, machine tools, vehicles, earth-moving equipment and lifting devices. Special techniques in machine repairs. Planning and organization of service and maintenance shops. Planning of the spares stock and related problems.

MCE 511: INTERNAL COMBUSTION ENGINES (3 Units)

Analysis, design and performance of spark-ignition and compression-ignition piston engines. Fuel injection, carburetion and combustion. Multistage piston engine dynamics, mass balancing and vibration control. Combustion in and performance of internal combustion engines. Basic types and performance. Governors and control systems. Engine testing.

MCE 513: HEAT TRANSFER (3 Units)

Theory of steady state heat conduction, convection and radiation. Dimensional analysis and similitude in heat transfer theory. Analogy between mass and momentum transfer, boundary layer flows relations use in convection heat transfer calculations. Materials and design of heat exchangers. Introduction to mass transfer, analogy between heat and mass transfer.

MCE 515: CORROSION AND WEAR (3 Units)

Basic theories and concepts of corrosion and oxidation. Types of corrosion: electrochemical, mechanical, microbial. The effect of environmental factors on corrosion. Oxidation temperature, pressure, nature of service medium. Corrosion damage: surface pitting and micro structural damage. Corrosion fatigue, stress corrosion cracking. Corrosion prevention: prevention through design, selection of materials and conditioning of the service environment, protection by surface treatment, surface coating and mechanical cladding. Corrosion measurement and monitoring.

MCE 517: AUTOMOBILE ENGINEERING (3 Units)

Mechanics of vehicles. Vehicle component and design. Traction engine and transmission data. Fuel system, clutches, gear boxes – manual and automatic. Transmissions, steering systems. Brakes, tyres. Air conditioning. Electrical system. Exhaust system. Ignition system. Body and chassis.

MCE 502: PRODUCTION ENGINEERING II (3 Units)

Specification and standardization: Interchangeable manufacture, preferred sizes, limits and fits. Fundamentals of measurement: length, standards, sources of error, angular measurements; comparators, autocollimator, indirect measurements, straightness and flatness testing. Surface finish. Fundamentals of gauge design. Screws threads, specification, tolerancing, gauging and measurements. Statistical methods of process control. Principles of planning and tools design. Industrial health and safety. Ergonomics. Elements of cleaner production and applications in mechanical engineering. Demand forecasts. Plant location analysis. Plant layout analysis. Application of computer in production management.

MCE 506: FLUID MACHINERY (3 Units)

Types of fluid machines, classifications. Positive displacement machines: Reciprocating and rotary pumps. Compressors. Hydraulic motors. Rotodynamic machines: Basic theory, performance. Axial-flow, centrifugal and mixed-flow pumps, fans, compressors and turbines, selection of appropriate fluid machines.

MCE 508: POWER GENERATING PLANTS (3 Units)

Design performance and selection of prime movers for small power generating plants. Diesel and gas turbine plants. Thermal and hydroelectric power stations, their types, mechanical systems and installations, performance, operation and maintenance. Fundamental of electrical generators, performance and energy distribution systems.

MCE 510: INDUSTRIAL ENGINEERING (3 Units)

Introduction, system engineering applied to the design of industrial business system and organization. Industrial organization. Operation subsystem design, production planning and control, purchasing. Motion and time study. Factory planning and materials handling. Industrial standardization. Tool and manufacturing engineering. Industrial statistics. Inspection and quality control. The attitudes of organized labour towards industrial engineering methods.

MCE 514: ADVANCE MACHINE DESIGN II (2 Units)

Belts, bolt loading, brakes, clutches and couplings, gears and gear drives, springs, ropes, chain drives. Hoist. Welding design. Surface finch. Friction and wear. Bearings and lubrication. Pressure cylinders. Vibration consideration in designs. Design project.

MCE 518: MECHANICAL EQUIPMENT FOR BUILDINGS AND STRUCTURES (3 Units)
Mechanical units and systems in residential and industrial buildings such as pumps, tanks, fans, heat exchangers, cooling towers. Water supply, sanitation and gas systems. Lifts and their installation and operation. Boilers and steam supply systems. Codes and safety requirements. Control systems. Materials and specifications.

MCE 504: FRACTURE OF STRUCTURAL MATERIALS (3 Units)
Application of Theory of Elasticity to Two- and Three-dimensional Problems in Engineering. Fundamentals of plasticity, Various approximate methods applied to elastoplastic problems of bending of beams and torsion and bars. Conventional design concepts in relation to fractures; the mechanics of fracture. Designing and testing for fracture resistance. Microscopic aspects of fracture. Fracture of specific materials. Fatigue. Failure analysis and failure prediction methods.

MCE 512: ADVANCE COMPUTER-AIDED DESIGN AND MANUFACTURE (3 Units)
Mechanics of movement of living creatures. Mechanics of motion. Elements of robotics. Sensors and actuators. Introduction to elements of CAD/CAM systems. Principal types of CAD/CAM. The software standardization. Identifying a company's need for CAD/CAM. Installation and operation of CAD/CAM systems. Role of computers in production and control. CAD/CAM Softwares. Applications in various Engineering Set-ups.

MCE 516: ENERGY TECHNOLOGY (3 Units)
Energy and society. Sources of energy. Energy demand, supply and forecasting. Conventional and unconventional (renewable) energy. Energy conversion systems and devices for oil, gas, coal, heat, wood, solar, wind, biomass, tidal geothermal, etc. Renewable energy from the global environment perspectives; global warming potential of fossil fuels. New energy sources such as hydrogen. Energy conservation.

MCE 520: METALLURGY II (3 Units)
Classification of transformations: Order of transformation, Classification by structural and kinetic features. Generalized approach to a reaction equation. Free energy consideration and the equilibrium diagram spinoidal decomposition. Nucleation: Random, non-random, site-saturation, measurement, growth morphology of particles, lamellar growth partitioning, coalescence, measurement. Metastability. Hardening Mechanism (precipitation hardening, solid solution dispersion hardening etc.) Theory of Martensitic transformation, massive and bainitic transformation micro-structure of martensite and tempermartensite. Tempering effects of alloying elements, secondary hardening. Controlled transformation in steels. Physical metallurgy of alloy steels. Metallurgy of maraging

steels. Temper brittleness; Overheating and burning of steels, super plasticity.

MCE 522: ENGINEERING LAW (2 Units)

General**:** Types of Law: Definition, qualities of law, written and unwritten laws, sources of Nigerian law, customary law (Native law and custom), English law – common law, doctrines of equity, the statues, decrees and edicts, significance of law to engineers.

Contracts: definition, offer and acceptance, contract agreement, term legal and void, contractual rights to include right of occupancy, discharge of contract by agreement, breach, frustrations and lapse of time

Law of Torts: Definition, Tort of trespass, tort of conversion, issues involving liability for interference with business transaction, right and obligations of lessor/lessee

Sales and Mortgages: Sale and agreement to sell, elements in the sale, for existing, unascertained and specific, transfer of ownership of estate, how mortgages are created, acquisition, registration and administration.

MCE 597: SEMINAR I (1 Units)

Each student is expected to carry out a significant design project in Mechanical Engineering under the supervision of an academic staff or a supervisory panel of academic staff. The student is expected to make an oral presentation at a proposal (pre-data) seminar on the project topic.

MCE 598: SEMINAR II (1 Units)

Each student is expected to carry out a significant design project in Mechanical Engineering under the supervision of an academic staff or a supervisory panel of academic staff. The student is expected to make an oral presentation at a proposal (post-data) seminar on the project topic.

MCE 599: PROJECT (4 Units)

The final year project could be directed at solving an identified problem related to Mechanical Engineering. The project may originate from staff, students, or external sources. They may have a diverse nature and serve diverse needs. Multi-disciplinary projects are encouraged. A final report on the research project should be compiled, typed and bound in a format designed by the department. The seminar presentation, the project reports, and the student's performance at a viva-voce defence before a panel of internal and external examiners will be used in different degrees in the assessments of the students' projects.

DEPARTMENT OF MECHATRONICS ENGINEERING

Philosophy

The philosophy that guides the training programme is to produce graduates with high academic standard and adequate skills in mechatronics engineering to promote rapid industrialization and automation of industrial processes for self-reliance and environmental sustainability.

Objectives

The objectives of the Department are to produce graduates who will be able to:

i. design engineering projects and produce components, machines, equipment and systems.
ii. design and develop new products and production techniques and manage people, funds, materials and equipment in industries.
iii. install and maintain complex engineering systems so that they can perform optimally in our environment.
iv. adapt and adopt exogenous technology in order to solve local engineering problems.
v. exercise original thoughts, have sound professional judgement and be able to take responsibility for the direction of important tasks and function effectively in multidisciplinary teams and projects.

Staff List

Name	Degrees	Specialization	Designation
D. O. Aborisade	B.Eng. (Owerri)., M.Eng., Ph.D.*(Ilorin),* MNSE, R. Eng. (COREN)	Signal Processing and Control Engineering	Professor and Head of Department
A. T. Oyelami	B.Tech (Ogbomoso)., M.Eng (Akure). PhD (Abeokuta); MNSE, MMSN, R.Engr. (COREN)	Design, Modeling and Simulation	Lecturer I
I. B. Oronti	M. Sc. (Lagos), B. Sc. (Ibadan), MNSE, R.Eng.	*Electronics,* Communication and Signal Processing	Lecturer II
S. O. Owoeye	B.Eng.(Ilorin), M.Eng. (Abeokuta)	Embedded System	Assistant Lecturer
A. A. Ishola	B.Sc.(Ogun) M.Sc. (UK)., MNSE, R.Eng. (COREN)	Mechanical, Aerospace, Mechatronics	Assistant Lecturer

100 Level: First Semester

Course Code	Course Title	U	L	T	P
GNS 101	Use of English	2	2	-	-
GNS 111	Introduction to Social Problems	1	1	-	-
MCE 101	Introduction to Engineering Drawing	2	1	-	1
CHM 101	Physical Chemistry	3	2	1	-
CHM 191	Practical Chemistry I	1	-	-	1
MTS 101	Algebra	3	2	1	-
MTS 103	Vectors and Geometry	2	2	-	-
PHS 101	General Physics I	3	2	1	-
PHS 191	Physics Laboratory I	1	-	-	1
MCE 103	Introduction to Mechanics I	1	1	-	-
GNS 102	Introduction to Nigerian History	1	1	-	-
GNS 203	Use of Library	1	1	-	-
Total		**21**	**15**	**3**	**3**

100 Level: Second Semester

Course Code	Course Title	U	L	T	P
MTE 102	Introduction to Mechatronics Engineering	1	1	-	-
ABE 106	Elementary Fluid Flow	1	1	-	-
CHM 102	Introductory Organic Chemistry	2	2	-	-
CHM 104	Introductory Inorganic Chemistry	2	2	-	-
CHM 192	Practical Chemistry II	1	-	-	1
MTS 102	Calculus and Trigonometry	3	2	1	-
MTS 104	Mechanics	3	2	1	-
PHS 102	General Physics II	3	2	1	-
PHS 192	Physics Laboratory II	1	-	-	1
STS 102	Introduction to Statistics	2	2	-	-
Total		**19**	**14**	**3**	**2**

200 Level: First Semester

Course Code	Course Title	U	L	T	P
ABE201	Engineering Drawing I	2	1	-	1
CVE 201	Engineer in Society	1	1	-	-
MCE 201	Engineering Mechanics I	2	2	-	-
MCE 203	Engineering Materials	3	2	1	-
MCE 205	Fluid Mechanics I	3	2	1	-
ELE 201	Applied Electricity I	2	2	-	-
ELE 203	Fundamentals of Information and Communication Technology	2	1	-	1
ELE 291	Applied Electricity Laboratory I	1	-	-	1
CSC 201	Introduction to Computer Sciences	3	2		1
GNS 201	Writing and literary appreciati on	1	1	-	-
MTS 201	Mathematical Foundations	3	2	1	-
Total		**23**	**16**	**3**	**4**

200 Level: Second Semester

Course Code	Course Title	U	L	T	P
ABE 202	Engineering Drawing II	2	1	-	1
ABE 204	Workshop Practice	2	1	-	1
CVE 202	Strength of Materials	2	2	-	-
ELE 202	Applied Electricity II	2	2	-	-
ELE 292	Applied Electricity Laboratory II	1	-	-	1
MCE 202	Engineering Mechanics II	2	2	-	-
MCE 204	Engineering Thermodynamics	3	2	-	1
MTS 232	Ordinary Differential Equations	2	2	-	-
GNS 204	Logic and History of Science	2	2	-	-
GNS 206	Peace and Conflict Resolution	2	2	-	-
ETS 206	Entrepreneurial Studies & Change Management	2	2	-	-
Total		**22**	**18**	**-**	**4**

300 Level: First Semester

Course Code	Course Title	U	L	T	P
ELE 301	Electrical Circuit Theory I	3	2	1	-
ELE 303	Electromagnetic Field Theory I	3	2	-	1
ELE 305	Electromechanical Devices and Machines I	3	2	-	1
ELE 307	Electronics Circuits I	3	2	1	-
ELE 391	Circuits and Electronic Lab I	2	-	-	2
ELE 393	Electrical Machine Lab I	1	-	-	1
MCE 321	Mechanics of Machines I	3	2	-	1
MCE 325	Applied Thermodynamics I	3	2		1
MCE 341	Engineering Mathematics I	3	2	1	
TOTAL		**24**	**14**	**3**	**7**

300 Level: Second Semester

Course Code	Course Title	U	L	T	P
MTE 302	Sensors, Actuators and Virtual Lab.	3	2	-	1
MTE 304	Digital Systems and PLCs	3	2	1	-
MTE 306	Signals and Systems	2	2	-	-
ELE 302	Electric Circuit Theory II	3	2	1	-
ELE 308	Electronic Circuits II	3	2	1	-
ELE 342	Engineering Mathematics II	3	2	1	-
ELE 392	Circuits and Electronic Lab II	2	-	-	2
MTE 350	Engineering Entrepreneurship	2	2	-	-
	TOTAL	**21**	**14**	**4**	**3**

400 Level: First Semester

Course Code	Course Title	U	L	T	P
MTE 401	Computer Aided Design and Manufacturing	2	2	-	-
MTE 403	Group Project	2	-	-	2
MTE 405	CAD/CAM/CNC Laboratory	2	-	-	2
MTE 407	Computer Hardware Engineering	2	2	-	-
MCE 403	Heat and Mass Transfer	3	2	-	1
ELE 403	Servomechanism and Control Engineering	3	2	1	-
ELE 407	Measurement and Instrumentation	2	1	-	1
ELE 409	Power Electronics and Drives	3	2	1	-
ABE 413	Engineering Communication	2	2	-	-
ABE 443	Statistics for Engineers	3	2	1	-
	TOTAL	**24**	**15**	**3**	**6**

400 Level: Second Semester

Course Code	Course Title	U	L	T	P
MTE 200	Students' Work Experience Programme (SWEP)	3	-	-	3
MTE 297	SWEP Seminar & Report	2	-	-	2
MTE 300	Students' Industrial Work Experience I (SIWES I)	3	-	-	3
MTE 397	SIWES I Seminar	2	-	-	2
MTE 400	Students' Industrial Work Experience II (SIWES II)	8	-	-	8
MTE 468	SIWES II Report &Seminar	2	-	-	2
	TOTAL	**20**	**-**	**-**	**20**

500 Level: First Semester

Course Code	Course Title	U	L	T	P
MTE 501	Introduction to Robotics	2	2	-	-
MTE 503	Microcomputers and Microprocessor Systems	3	2	1	-
MTE 505	Process Automation	2	2	-	-
MTE 507	Digital Signal Modeling	3	2	1	-
MTE 509	Partial Automation Laboratory	2	-	-	2
ELE 501	Control Engineering I	3	2	1	-
MTE 511	Engineering Management	3	2	1	-
MTE 597	Seminar I	1	-	-	1
	Elective (1)	2	2	-	-
	TOTAL	**21**	**14**	**4**	**3**
	ELECTIVES				
MTE 517	Microcontrollers and Embe dded System	2	2	-	-
MTE 519	Computer Aided Product Modelling	2	2	-	-
MTE 521	Mobile Robotics	2	2	-	-
MTE 523	Renewable Energy Systems	2	2	-	-

500 Level: Second Semester

Course Code	Course Title	U	L	T	P
MTE 502	Automation and Robotics	3	2	1	-
MTE 504	Computer Software Engineering	2	2	-	-
MTE 506	Systems Modelling and Simulation	3	2	1	-
MTE 508	Vibrations	2	2	-	-
MTE 510	Full Automation Laboratory	2	-	-	2
MTE 512	MEMS and VLSI	3	2	1	-
MCE 522	Engineering Law	2	2	-	-
MTE 598	Seminar II	1	-	-	1
MTE 599	Research project	4	-	-	4
	Elective (1)	2	2	-	-
	TOTAL	**24**	**14**	**3**	**7**
	ELECTIVES				
MTE 514	Micro Fabrication Technology	2	2	-	-
MTE 516	Control Engineering II	2	2	-	-
MTE 518	Lean Production Mgt. & Ind. Logistics	2	2	-	-
MTE 520	Machine Vision	2	2	-	-

COURSE SYNOPSES

MTE 102: INTRODUCTION TO MECHATRONICS ENGINEERING (1 Unit)
Definition of Mechatronics Engineering, various branches (options): Control systems Engineering, Robotics, Software engineering, Application of Mechatronic Engineering to industrial development. Job prospects for Mechatronics engineers

MT 200: STUDENTS' WORK EXPERIENCE PROGRAMME (SWEP) (4 Units)
Students would be attached to engineering Sections in the University for the long vacation where they are expected to receive practical engineering knowledge with emphasis on mechanical engineering operations. Detailed report of Students experience and activities during the period of attachment would be submitted by the Students not later than the first week of the following Semester. These records and other factors would be assessed including oral presentation of experience at Students Seminar and on-site assessment.

MTE 302: SENSORS, ACTUATORS AND VIRTUAL LABORATORY (3 Units)
Electrical Actuators: Review of Electrical Motors and their types, Motor Equations, Drivers, and Control of DC Motors, Induction Motors, Synchronous Motors, and Stepper Motors. Hydraulic Actuators: Pumps and its Different Types, Hydraulic Motors and Its Different Types, Valves and Its Different Types, Power Supplies, Cylinders, Accumulators, Intensifiers, Lifts, Couplings, Torque Converters. Hydraulic

Circuit Design and Analysis. Pneumatic Actuators: Compressors, Fluid Conditioners, Pneumatic Cylinders, Valves and Plugs, Basic Pneumatic Circuit Design & Analysis, Accumulator system Analysis. Motion Transducers: Potentiometer, Variable Inductance Transducers, Permanent Magnet Transducers, Variable Capacitance Transducers, Piezoelectric Transducers, and Proximity Transducers. Effort Sensors: Strain Gages, Torque Sensors, Tactile Sensors. Virtual Laboratory Experiments: transfer in the basics disciplines of Mechatronics like: Pneumatics/Electro-Pneumatics, Hydraulics/Electro-Hydraulics, Electrics/Electronics, Sensories, AC-motors, Open/Close loop Technology, Process Automation, Fieldbus Technology.

MTE 304: DIGITAL SYSTEMS AND PLCs (3 Units)

Digital representation of information and binary arithmetic. Position number system, binary coding of alpha numeric characters in the computer, simple error detecting and correcting codes. (parity bits, Hamming codes). Arithmetic in various radio systems. Binary arithmetic in combination logic. Notion of feedback state and delay in logic circuit; basic difference synchronous sequential circuits; illustration of the use of state transition equations, diagrams, tables etc in sequential logic by their use in defining the operation of sychronized or clocked flip flops (such as r.s, JKT etc flip flops). Edge triggered and master flip-flops.

MTE 306: SIGNALS AND SYSTEMS (2 Units)

System modelling. Analog signals. Convolution and correlation. Fourier and Laplace Transforms. Random Processes. Sampled signals and systems. Discrete Fourier transforms. Z transforms. Analog and Digital filters. Control strategies; Open-loop, feed forward and feedback control systems. Stability, performance and sensitivity analyses. Lag and Lead compensation. Frequency domain design. PID controllers. Elements of nonlinear control.

MTE 350: ENGINEERING ENTREPRENEURSHIP (2 Units)

Identifying entrepreneurial ability; Characteristics of an entrepreneur. Entrepreneurs Trajectories. Characteristics of successful innovative engineers. Creativity. Charting Business Strategy: vision and mission; developing a business plan. Financial Management: procuring funds; kinds of capital; financial statements (balance sheet, profit and loss account); cost control; Planning and Controlling Operations: Operational considerations and management; operating ratios of an enterprise. Risk Management in Entrepreneurship. Human Resource Management. Legal Requirements of an Enterprise: registration, legal commitments; intellectual property; copyright. Managing Growth Professional Ethics and Standards in Business. Selected Business Venture Areas

MTE 300: STUDENTS' INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES I) (4 Units)

Students would be attached to Mechatronics Engineering based industries for the

long vacation period of 3 months. They are expected to receive practical training in process automation, software engineering, robotics, control systems, avionics etc

MTE 401: COMPUTER AIDED DESIGN AND MANUFACTURING (2 Units)
Exploring rapid product development and technologies aimed at reducing product development lead-time within a Design for Manufacture (DFM) context. CNC Programming. Rapid Prototyping. Introduction to CAD/CAM, Area of its applications and importance. How CAD/CAM works. Extensive introduction to CAD/CAM packages: PTC Creo Parametric, CNC Simulator, Pro/Mechanism.

MTE 403: GROUP PROJECT (2 Units)
Identifying problem requirements. Generating and evaluating design concepts; design and fabrication. Design control software. Testing and debugging of systems. Documentation of design and results.

MTE 405: CAD/CAM/CNC LABORATORY (2 Units).
Computer aided design/Computer aided manufacturing/Computer numerical control Experiments: Planning and design of Mechatronics part systems. CNC programming for Turn and Mill, Manufacturing operations, models and metrics, automation. Material transport and storage systems. Manufacturing systems, single cells, assembly lines, Cellular manufacturing and flexible manufacturing systems. Simulation of manufacturing systems, robotics, Production of Mechatronics part systems.

MTE 407: COMPUTER HARDWARE ENGINEERING (2 Units)
Digital logic. Data representation. Digital components and signals. Combinational and sequential logic design and realization. Microprocessor system design and programming. Simple and complex programmable logic devices. Hardware description languages and introduction to VHDL. CPU design and field programmable gate arrays (FPGAs) P-N Junction diode. Elementary discrete devices fabrication techniques and IC technology.

MTE 400: STUDENTS' INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES II)(4 Units)
Students would be attached to Mechatronics Engineering Establishments where they are expected to obtain in-depth practical training in Mechatronics Engineering operations. Detailed report of Students experience and activities during the period of attachment would be submitted by the Students not later than the first week of the following Semester. These records and other factors would be assessed including oral presentation of experience at Students Seminar and on-site assessment.

MTE 501: INTRODUCTION TO ROBOTICS (2 Units)

Robot Classification. Robot Specifications.Direct Kinematics: Mathematical background. D-H representation. The Arm equation. Examples. Inverse Kinematics: The inverse kinematics problem and its solution. Tool configuration. Examples of various robots. Introduction to Manipulator Dynamics: Lagrange's Equation, Lagrange-Euler Dynamic Model. Use of Sensors and Vision System in Robotic System.

MTE 503: MICROCOMPUTERS AND MICROPROCESSOR SYSTEMS (3 Units)

Hardwired logic contrasted with program logic. Microcomputer applications. Elements of microcomputer architecture; bus, microprocessor, memory, input-output, peripherals, Single chip and multichip microcomputers. Overview of available microcomputer systems. Internal architecture; 3-bus concept, microprocessor operation. Microprocessor instruction set; instruction format, addressing modes; instructions execution. Comparison of available microprocessors. Machine language, assembly language and high level language programming. Synthesis of combinational logic circuits with ROMS and PLAs. Review of classical approach to sequential circuit design. The algorithmic state machine chart (ASM) method of representing sequential problems. Realization of sequential circuits using MSI and LSI. Register transfer languages.

MTE 505: PROCESS AUTOMATION (3 Units)

PLC programming higher functions. PLC-programming analogue in/outputs. 2-step controller. Basics in closed loop control. Closed loop temperature control. Closed loop pressure control. Closed loop flow control. Closed loop level control

MTE 507: DIGITAL SIGNAL MODELLING (3 Units)

The Concepts of sampling, quantization and aliasing. Discrete time signals and systems, discrete convolution, Z transforms, Z plane poles and zeros. Discrete Fourier transforms. Fast Fourier Transform. Concept of digital filtering, types of digital filters and properties. Digital transfer functions. One dimensional recursive and non recursive filters. Spectral transforms and their application in synthesis of high-pass and band-pass filters. Computer techniques in filter synthesis. Realization of filters in hardware and software. Basic image processing concepts.

MTE 509: PARTIAL AUTOMATION LABORATORY (2 Units)

Partial Automation :- Factory Automation Factory Automation study fields:
- PLC programming level 1 -3, - Industrial communication – Fieldbus, - DC/AC motor - SCADA - Touch panel - Assembly/disassembly or Mechatronics part systems

MTE 511: ENGINEERING MANAGEMENT (3 Units)

Principles of organization; elements of organization; management by objectives.

Financial management, accounting methods, financial statements, cost planning and control, budget and budgetary control. Depreciation accounting and valuation of assets. Personnel management, selection, recruitment and training, job evaluation and merit rating. Industrial psychology. Resource management; contracts, interest formulae, rate of return,. Methods of economic evaluation. Planning decision making; forecasting, scheduling. Production control. Gantt Chart, CPM and PERT. Optimization, linear programming as an aid to decision making, transport and materials handling. Raw materials and equipment. Facility layout and location. Basic principles of work study. Principles of motion economy. Ergonomics in the design of equipment and process.

MTE 517: MICROCOMPUTERS AND EMBEDDED SYSTEMS (2 Units)

Microprocessor organization and interfacing: Memory interfacing. Hardware-software design of microprocessor systems. Introduction to Embedded Microcomputer Systems. Architectures of programmable digital signal processor. Programming for real-time performance. Design and implementation of data scrambler and interfaces to telecommunications.

MTE 519: COMPUTER AIDED PRODUCT MODELLING (2 Units)

Geometric reasoning. Solid modelling, feature extraction, grasping, tolerancing. Product Design and Development: Mass Properties, Assembly Modelling, Finite Element Method, Product Data Exchange, Collaboration Design

MTE 521: MOBILE ROBOTICS (2 Units)

Machine vision and pattern recognition. Applications of identification trees, neural nets, genetics algorithms and other learning paradigms.

MTE 523: RENEWABLE ENERGY SYSTEMS (2 Units)

Energy and Society. Sources of Energy. Energy demand and supply. Conventional and unconventional (renewable) energy. Energy conversion systems and devices for oil, gas, coal, heat, wood, nuclear, solar, wind, biomass, tidal, etc. Energy conservation. Energy Auditing. Nature and availability of wind energy; wind turbines, classification, construction and control; performance evaluation methods; power, efficiency, reliability and cost; load matching; nature and availability of solar radiation; radiation estimations and measuring instruments; materials for solar energy utilisation, radiative properties and thermal transport properties; introduction to non-concentrating collectors, design techniques and performance estimation; solar component and solar system operational characteristics; practical applications of solar energy, special solar devices for developing countries; and desalination, photovoltaics and solar water pumping.

MTE 502: AUTOMATION AND ROBOTICS (3 Units)

Introduction to automation: Economics of Automation, Flow Lines, Mathematical Models, Storage Buffers, Partial Automation, Balancing, Group Technology and Flexible Manufacturing.

Programmable Logic Controllers: Introduction to PLCs, Advantages of PLCs, Ladder Logic Diagrams, Switching Logic. Components of PLC, PLC Operating Cycle, Additional Capabilities of a PLC, Latches, Design Cases (Deadman Switches, Conveyor, Accept/Reject Sorting), Addressing.

PLC connection, PLC operation, Numbering, Event based logic, sequential logic design, Advanced ladder logic functions. PLC Programming, Structured text programming, Instruction list programming, Function block programming, Continuous control, PLC data communication, Human Machine Interfaces (HMI), Selecting a PLC.

MTE 504: COMPUTER SOFTWARE ENGINEERING (2 Units)

Introduction to software engineering fundamentals. Object oriented programming. Number representations. Data structure and algorithms, Abstraction, modules and objects. Designing for efficiency.

Object oriented software design, implementation and testing. Team software specification and management. Cross-platform tools and GUI development. Advanced software algorithms and architecture. Software engineering practice and methods.

MTE 506: SYSTEMS MODELLING AND SIMULATION (3 Units)

System identification and characteristic. System modelling. Installation considerations; generation of noise and its attenuation. Selection of equipment for particular applications. Review of currently available products. Control elements. System analysis and design; industrial application. Interfacing with programmable logic controllers and computers.

MTE 508: VIBRATIONS (2 Units)

Mechanical systems with one and several degrees of freedom, free, forced, and damped vibrations. Vibration problem solution by nodal analysis. Continuous systems, including exact and finite-element methods. Approximate methods of solution; Computer solutions: Vibration Isolation and absorption. Machine balancing.

MTE 510: FULL AUTOMATION LABORATORY (2 Units)

Full Automation Study fields: Material/signal flow in a networked system, Installation and commissioning of a Mechatronics system, Programming and communication in a Mechatronics system, Maintenance and Trouble Shooting in a

Mechatronics system.

MTE 512: MEMS AND VLSI (3 Units)

Basic microelectronic devices; a brief review of the physics involved. Fabrication technology of microelectronic devices. IC fabrication technology (CMOS). Silicon crystal growth, epitaxy. Ion implantation, etching, chemical vapour deposition and photolithography. Silicon bulk and surface micromachining technology for Microsystems or MEMS.

MCE 522: ENGINEERING LAW (2 units)

General: Types of law: Definition, qualities of law, written and unwritten laws, source of Nigerian law, customary law (Native law and custom), English law – common law, doctrines of equity, the statues decrees and edicts, significance of law to engineers. Contracts: definition, offer and acceptance, contract agreement, term legal and void, contractual rights to include Rights of occupancy, discharge of contract by agreement, breach, frustrations and lapse of time. Law of torts: Definition, tort of trespass, tort of conversion, issues involving liability for interference with business transaction, right and obligations of less or/lessee. Sales and mortgages: Sales and agreement to sell, elements in the sale, for existing, unascertained and specific, transfer of ownership of estate, how mortgages are created, acquisition, registration and administration.

MTE 599: PROJECT (4 Units)

The final year project could be directed at solving an identified problem related to Mechatronic Engineering. The project may originate from staff, students, or external sources. They may have a diverse nature and serve diverse needs. Multi-disciplinary projects are encouraged. A final report on the research project should be compiled, typed and bound in a format designed by the department. The seminar presentation, the project reports, and the student's performance at a viva-voce defence before a panel of internal and external examiners will be used in different degrees in the assessments of the students' projects.

MTE 514: MICRO-FABRICATION TECHNOLOGY (2 Units)

Crystal growth, thermal oxidation, photolithography, etching, diffusion, iron implantation, film deposition, metallization, layout, process integration, IC manufacturing, MEMS, CAD tools for micro-fabrication (e.g. SUPREM, PROLITH etc.). Future trends and challenges.

MTE 516: CONTROL ENGINEERING II (2 Units)

Review of basic control theory. Analysis and design using Root's locus. System optimization using error criteria. Non linear systems. Describing and phase plane

methods, multivariable systems, advanced analog and hybrid computing.

MTE 518: LEAN PRODUCTION MANAGEMENT AND INDUSTRIAL LOGISTICS
(2 Units)

Material and information flows within a company, providing practical experience for all employees involved in lean production projects, inventory minimisation as an important basis for increased productivity, the principle of pull production control, advantages compared to conventional production control methods, types and function of different pull production control methods, application of methods, Kanban – the classic pull principle, introduction to Value Stream Mapping (VSM). Lean manufacturing, flow production, throughput time and inventories while increasing flexibility, analysis of workplaces with the Standard Operation Sheet, adjusting the cycle times of individual workplaces, flow and takt time production, avoidance of material transport with linear and U layouts, Structure and development of open-plan production, Line Back system, integration of logistic processes with kanban, flexible employee systems: relay and caravan systems, multimachine operation. Quality control.

MTE 520: MACHINE VISION **(2 Units)**

Advanced techniques and algorithms used in real-time computer vision and image processing design

MTE 597: SEMINAR I **(1 Units)**

Each student is expected to carry out a significant design project in Mechatronic Engineering under the supervision of an academic staff or a supervisory panel of academic staff. The student is expected to make an oral presentation at a proposal (pre-data) seminar on the project topic.

MTE 598: SEMINAR II **(1 Units)**

Each student is expected to carry out a significant design project in Mechatronic Engineering under the supervision of an academic staff or a supervisory panel of academic staff. The student is expected to make an oral presentation at a proposal (post-data) seminar on the project topic.

MTE 599: PROJECT **(4 Units)**

The final year project could be directed at solving an identified problem related to Mechatronic Engineering. The project may originate from staff, students, or external sources. They may have a diverse nature and serve diverse needs. Multi-disciplinary projects are encouraged. A final report on the research project should be compiled, typed and bound in a format designed by the department. The seminar presentation, the project reports, and the student's performance at a viva-voce defence before a panel of internal and external examiners will be used in different degrees in the assessments of the students' projects.

COLLEGE OF ENVIRONMENTAL RESOURCES MANAGEMENT

Preamble

The College of Environmental Resources Management (COLERM) was established with four other Colleges at the inception of the University of Agriculture, Abeokuta in 1988. Currently, the Departments in the College which offer five years Bachelor degree programmes are:

(i) Department of Aquaculture and Fisheries Management
(ii) Department of Environmental Management and Toxicology
(iii) Department of Forestry and Wildlife Management
(iv) Department of Water Resources Management and Agro meteorology

Philosophy, Objectives and Mandate

The primary philosophy that guides the training of students is the production of skilled manpower that is adequately furnished with the comprehensive information required for engaging in economic agricultural production in an environment characterized by rural setting and adequate land endowment. Such knowledgeable professional manpower has to be produced in an atmosphere with the widest possible human and material resources, through the adoption of effective techniques of instruction and exposure to the actual practice of agriculture. Consequently, there are opportunities for formal training at the undergraduate and postgraduate levels for the acquisition of basic and high degrees respectively. These training programmes are mounted through classroom instruction, laboratory practicals, field demonstrations and workshop practices. Deriving from the foregoing philosophy and the major objectives of the University, the aims of the College, among others, are to:

i. assist in the attainment of self-sufficiency in the production of basic food;
ii. contribute to the achievement of the goal of marked increase in the production of agricultural raw materials to support the growth of our several industries;
iii. enhance the production and processing of export produce;
iv. enhance with emphasis on relevant, appropriate and manageable technology

to modernize agricultural production, processing, storage, preservation and distribution;

v. enhance the rural employment opportunities and the attendant improvement of the quality of rural life;

vi. evolve effective ways of protecting agricultural land resources from ecological degradation such as erosion, pollution, etc.

vii. develop new patterns of agricultural structures and government policies which clearly demonstrate that agriculture is an important part of our national economy.

Dean's Office

Name	Qualification	Designation
I. T. Omoniyi	B.Sc., M.Sc., Ph.D. (Ibadan)	Professor and Dean
O. Oguntoke	B.Sc., M.Sc., Ph.D. (Ibadan)	Senior Lecturer and Deputy Dean

GENERAL 100 LEVEL COURSES FOR ALL DEGREE PROGRAMMES IN COLERM

The following courses are taken by all 100 level students registered into all 5 years Bachelor Degree Programmes in COLERM.

100 Level: First Semester

Course Code	Course Title	U	L	T	P
CHM 101	Introductory Physical Chemistry I	3	3	-	-
BIO 101	General Biology I	2	2	-	-
BIO 103	Introductory Physiology I	2	2	-	-
BIO 191	Practical Biology I	1	-	-	1
CHM 191	Practical Chemistry I	1	-	-	1
MTS 105	Mathematics for Non-Major	3	2	1	-
PHS 105	General Physics for Non-Major	3	2	-	1
PHS 191	Physics Laboratory I	1	-	-	1
	TOTAL	**16**	**11**	**1**	**4**

100 Level: Second Semester

Course Code	Course Title	U	L	T	P
GNS101	Use of English	2	2	-	-
GNS 102	Introduction to Nigeria History	1	1	-	-
GNS 111	Introduction to Social Problems	1	1	-	-
CHM 102	Introduction to Organic Chemistry	2	2	-	-
CHM 104	Introduction to inorganic Chemistry	2	2	-	-
MTS 106	Mathematics for Non-Major	3	2	1	-
CHM 192	Practical Chemistry II	1	-	-	1
AEM 102	Principle of Economics	2	2	-	-
PHS 106	General Physics for Non-Major II	3	3	-	-
PHS 192	Physics Laboratory II	1	-	-	1
BIO 102	General Biology II	2	2	-	-
BIO 192	Practical General Biology II	1	-	-	1
	TOTAL	**21**	**17**	**1**	**3**

DEPARTMENT OF AQUACULTURE AND FISHERIES MANAGEMENT

Preamble

The Department of Aquaculture and Fisheries Management (AQFM) was created out of the former Department of Fisheries, Forestry and Wildlife Management (FFWM) in 1992 with a vision to accelerate the teaching/training, adaptive research and outreach programmes. Before 1992, the former Department of FFWM has jointly trained and produced graduates with Fisheries and Wildlife option from inception of the University in 1989.

Today, the Department is one of the four Departments in the College of Environmental Resources Management (COLERM). The AQFM Department which currently has a total of eighteen (18) Academic, Five (5) Technical and Administrative staff offers programmes leading to the award of Bachelors, Postgraduate Diplomas, Masters and Doctoral Degree in Aquaculture and Fisheries Management. The Department also offers skill acquisition training programme in Aquaculture and Fisheries Management for international students under Foreign African Students' Scholarship Scheme (FUFASS).

In the year 2002, the Department was awarded the status of a Center of Excellence in Aquaculture and Fisheries by the Education Tax Fund (ETF) in recognition of giant strides made in the area of training, research and extension for quality manpower development and capacity building. The Department was also honoured with a Distinguished Service Award in August 2005 by the Fisheries Society of Nigeria (FISON) to recognize her achievements in Human Resources Development. The Department has earned a full accreditation status as assessed by the National Universities Commission (NUC) in 2005.

Vision Statement

Acceleration of the impetus towards fish self-sufficiency through teaching/training, adaptive research and outreach programmes.

Mission Statement

To achieve and maintain the lead in excellence in training well-equipped manpower for development and sustainable exploitation of the nation's aquatic resources.

Objectives

The main objectives of the Bachelor of Aquaculture and Fisheries Management Programme are:

1. To provide practically and theoretically-sound manpower in Fisheries who

will not only be job creators and hence be employers of labour but can also serve as sources of manpower for all fisheries and allied establishments locally, nationally and internationally.

2. To engage in fish production and purposeful research that will solve the country's fisheries development problems and increase the contribution of fisheries to the gross national product.

3. To equip the students with good management skills in fish production, processing and aqua-cultural practices that will revolutionize and boost fish production and utilization of the nation's vast marine, brackish and freshwater resources.

Graduation Requirements

It is expected that each student shall satisfy the general and specific requirements in their programmes as scheduled in regard to core/compulsory, optional, elective courses, and practicals. To qualify for a degree, each student should have completed and passed all the required courses.

Admission Requirements:

Minimum Graduation Requirements

To qualify for the award of the degree of Bachelor of Aquaculture and Fisheries Management, a student:

(a) must have spent a minimum of 3, 4 or 5 years on the programme depending on the year of entry

(b) Must have passed all the University compulsory courses.

(c) Must have passed all the Department's and College Core Courses and the required electives

(d) Should not have spent more than 2 years in excess of the prescribed minimum period for the award of degree.

(e) Should not have a CGPA less than 1.0 at end of the programme.

Admission Requirements

5 Credits WASCE/NECO which must include at least credit in Mathematics, English, Chemistry, Biology/Agricultural Science and at least credit in Physics

Degree in View	Direct Entry Requirement	JME Requirements	JME Subjects	Waivers and Special Consideration/Other qualification
Bachelor of Aquaculture & Fisheries Management	Two GCE 'A' level passes or equivalent in Chemistry and Biology. 'O' level credits should include all prescribed UME requirements.	SSS certificate credits in five subjects including Mathematics, English, Chemistry, and Biology **Or** Agricultural Science in not more than two sittings.	English, Biology or Agricultural Science, Chemistry and Physics or Mathematics	(i)Special consideration for admission given to OND/NCE/HND students with minimum of Upper Credits who have four of the UME requirements but present academic transcripts that show that they have effectively corrected their deficiencies in the fifth subject.

Programme/Sub-discipline/Discipline Structure to include period of formal studies in the University's Industrial Training (IT), planned visit and projects:

Academic Staff

NAME	QUALIFICATION(S)	SPECIALIZATION	DESIGNATION
A. A. Akinyemi	B.Sc , MAF, Ph.D (Abeokuta)	Fish Pathology	Reader
G. N. O. Ezeri	B.Sc (Nigeria), M.Sc, Ph.D (Jos).	Fish Pathology and Health	Professor
Yemi Akegbejo Samsons	B.Sc; M.Sc (Ibadan); DMA(Dalhousie); PGDE (Ibadan), Ph.D (Akure)	Aquaculture	Professor
W. O. Alegbeleye	B.Sc, M.Sc (Ibadan); M.Sc (Stirling); Ph.D (Ibadan)	Fish Nutrition	Professor
I. T. Omoniyi	B.Sc., M.Sc., Ph.D (Ibadan).	Fisheries Biology & Management	Professor
S. O. Obasa	B.Sc, M.Sc, Ph.D. Ibadan.	Fish Nutrition.	Professor
Francisca O. A. George	B.Sc (Nigeria) M.Sc (Ibadan) Ph.D (Abeokuta).	Aquaculture and Management.	Professor
Nofisat B. Ikenweiwe	B.Sc (Sokoto), M.Sc (Ibadan), Ph.D (Abeokuta).	Hydrobiology and Fisheries	Professor
Olubunmi T. Agbebi	B.Sc, MAF, Ph.D (Abeokuta).	Fishy Breeding and Genetics	Professor
D. O. Odulate	B.Sc, MAF, Ph.D (Abeokuta).	Fisheries Management	Reader
W.O. Abdul	B.Sc, MAF, Ph.D (Abeokuta).	Fisheries Management	Reader
F. I. Adeosun	B.Sc (Abeokuta), M.Sc (Ibadan) Ph.D (Abeokuta).	Fisheries Management and Hydrobiology	Reader
Iyabo O. Taiwo	HND (Zaria), B.Agric (Abeokuta), M.Sc(Ibadan), PhD (Lismore).	Fisheries Management	Principal Research Fellow