100 Level

1st Semester

Course Code	Course Title	Units	Prerequisite
GEG 101	Engineering Pure Maths	3	
GEG 103	Engineering Applied Maths I	3	
FSC 105	Introductory Physics I	3	
FSC 102	Physical Chemistry	3	
MEG 101	Workshop Practice	1	
MEG 103	Technical Drawing I	2	
GST 105	Use of English I	2	
GST 103	Nigerian people and Culture	2	
GST 102	Philosophy and Logic	2	
	Total	**21**	

2nd Semester

Course Code	Course Title	Units	Prerequisite
GEG 102	Engineering Pure Maths II	3	GEG 101
GEG 104	Engineering Applied Maths II	3	GEG 103
MEG 102	Workshop Practice	1	MEG 101
MEG 104	Technical Drawing II	2	MEG 103
PHS 102	Introductory Physics II	2	FSC 105
PHS 101	Introduction Physics III	3	FSC 105
PHS 103	Physics Lab	2	FSC 105
GST 106	Use of English	2	
GST 104	Philosophy	2	
	Total	**20**	

200 Level

1st Semester

Course Code	Course Title	Units	Prerequisite
EEG 201	Fundamental of Electrical Engineering I	2	FSC 105, GEG 101, GEG 103, PHS 101, PHS 102.
EEG 203	Signals and System Theory	2	FSC 105, GEG 101, GEG 103, PHS 101, PHS 102.
EEG 205	Electrical Engineering Materials	2	FSC 102, FSC 105, GEG 101, GEG 103, PHS 101, PHS 102.
EEG 207	Electrical System Graphic	2	
*EEG 209	Fundamental of Electrical Eng. Lab	1	FSC 105, GEG 101, GEG 103, PHS 101, PHS 102, PHS 103.
GEG 201	Engineering Mathematics	3	GEG 102, GEG 104
GST 201	General African Studies	2	
MEG 201	Thermodynamics	2	PHS 101, GEG 104
MEG 205	Engineering Mechanics I (Statics)	2	GEG 102, GEG 104
	Total	**18**	

***Laboratory Courses**

2nd Semester

Course Code	Course Title	Units	Prerequisite
CEG 202	Mechanics of Materials I	4	PHS 102
EEG 202	Fundamental of Electrical Engineering I	2	EEG 201
EEG 204	Introduction to Switching and Logic Systems	2	EEG 203
EEG 206	Computer Programming I	2	GEG 201
EEG 208	Physical Electronics	2	EEG 205
EEG 210	Fundamental of Electrical Engineering Lab II	1	EEG 201, EEG 209
GEG 202	Introductory Engineering Statistics	3	GEG 102, GEG 104
GST 202	General African Studies II	2	
MEG 202	Fluid Mechanics	3	MEG 201
MEG 208	Engineering Mechanics II (Dynamics)	3	MEG 205
	Total	**24**	

For year 2: Pre-requisites is a pass in all year 1 Physics and Mathematics courses

300 Level

1st Semester

Course Code	Course Title	Units	Prerequisite
CEG 311	Civil Engineering Technology	3	CEG 202
EEG 301	Circuits and System I	2	EEG 202, EEG 204
EEG 305	Electronic Circuit I	2	EEG 202, EEG 204
EEG 307	Instrumentation and measurement I	2	EEG 202, EEG 204
EEG 309	Energy Conversion	2	EEG 202
EEG 311	Computer Programming II	2	EEG 206
*EEG 313	Energy Conversion Laboratory	1	EEG 202, EEG 210
*EEG 315	Electronic Circuits Laboratory I	1	EEG 202, EEG 204, EEG 210
#EEG 320	Electrical Engineering Technology	3	EEG 202
GEG 301	Engineering Mathematics II	2	GEG 201
GST 307	Entrepreneurship and Good Governance I	2	
	Total	**19**	

2nd Semester

Course Code	Course Title	Units	Prerequisite
EEG 302	Circuit and Systems II	2	EEG 301
EEG 304	Transmission Lines and Filters	2	EEG 301

EEG 306	Electronic Circuits II	2	EEG 305
EEG 308	Power Electronics	2	EEG 305
EEG 310	Electrical Drives	2	EEG 308
EEG 312	Instrumentation and Measurement II	2	EEG 307
EEG 314	Logic Design of Digital Systems	2	EEG 204
*EEG 316	Electronic Circuits Laboratory II	1	EEG 305, EEG 315
#EEG 320	Electrical Engineering Technology	3	EEG 202
EEG 419	Electrical Drives Laboratory	1	EEG 308, EEG 318
MEG 311	Mechanical Engineering Technology	3	
GEG 302	Operational Method	2	
GST 307	Entrepreneurship and Good Governance II	2	
	Total	**23**	

***Laboratory Courses**
 # Required course for Mechanical & Civil Engineering Students.

400Level

1st Semester

Course Code	Course Title	Units	Prerequisite
EEG 401	Microprocessor and Microcomputer	2	EEG 312
EEG 403	Communication Systems	2	EEG 306, 302
EEG 405	Classical Control Systems	2	EEG 302
EEG 407	Active Networks	2	EEG 302, EEG 306
EEG 409	Power Transmission and Distribution	2	EEG 302
EEG 411	Electrical Machine Theory	2	EEG 310
EEG 415	Electromagnetic Waves Theory (EMWT) I	2	GEG 301
*EEG 417	Communications Laboratory	1	EEG 306, EEG 316
*EEG 421	Control Systems Laboratory	1	
*EEG 423	Microprocessor Laboratory	1	EEG 312, EEG 316
*EEG 431	Electrical Machines Theory Laboratory	1	EEG 202, EEG 210
GEG 401	Technical Communication	1	
GEG 402	Numerical Methods	3	
	Total	**22**	

2nd Semester

Course Code	Course Title	Units	Prerequisite
EEG 400	Industrial Training	8	

500 Level

1st Semester

Course Code	Course Title	Units	Prerequisite
EEG 501	Power System Analysis	2	EEG 409
EEG 503	Modern Communication Systems	2	EEG 403
EEG 505	Synthesis and Design of Control Systems	2	EEG 405
EEG 507	High Power Engineering	2	EEG 409
EEG 509	EWMT II	2	EEG 415
EEG 513	Project I	3	
GEG 501	Engineering Economics	2	
	Total	**15**	

Plus Minimum of 2 Electives

Course Code	Course Title	Units	Prerequisite
EEG 511	Power Systems Economics	2	EEG 409
EEG 515	Introduction to VLSI Design	2	EEG 401
EEG 517	Microcomputer Graphics	2	EEG 401
EEG 519	Power Systems Design, Planning and Equipment.	1	EEG 409
EEG 525	Telephony and facsimile Systems	2	EEG 403
CPE 505	Information Theory and Coding	2	EEG 312, 405
	Total	**19**	

2nd Semester

Course Code	Course Title	Units	Prerequisite
EEG 504	Power Systems Protection	2	EEG 501
EEG 510	Energy Management and Power Quality Assessment	2	EEG 501
EEG 512	Digital Signal Processing	2	EEG 505
EEG 514	Project II	3	
EEG 518	Microwave Engineering	2	EEG 509
GEG 502	Law and Management	2	
	Total	**13**	

Plus Minimum of 2 Electives

Course Code	Course Title	Units	Prerequisite
EEG 502	Digital Computer Design	2	EEG 401
EEG 506	Electrical Machine Design	2	EEG 411
EEG 508	High Power Engineering II	2	EEG 507
EEG 516	Antennas and Propagation	2	EEG 509
EEG 520	Digital Control Systems	2	EEG 405
	Total	**17**	

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING COURSE DESCRIPTION

EEG 201* - FUNDAMENTALS OF ELECTRICAL ENGINEERING I

Circuit Law: Kirchoff's Law, Tshevenin's Theorem, Norton's Theorem, Superposition Theorem, Millman's Theorem, Rosen's Theorem. Network problems arising in Energy distribution.
Methods of analysis suitable for the problems in Network Theory in terms of currents, voltages, energy/voltage amperes, Loop and Nodal analysis.
Resistors, Electric fields and capacitors, Magnetic fields and inductance. Energy stored in capacitors and inductors. Electromagnetic induction and Magnetic forces, self and mutual inductance.
Electrochemical power sources.

EEG 202 – FUNDAMENTALS OF ELECTRICAL ENGINEERING II

Emf. Generation, Single phase; rms, mean, form factor, peak factor, phasor and phasor diagram. Series and parallel resonance circuit. Resonance, Q-factor, impedance and power P, S, and Q3 phaser, delta and star conversion line and phase voltages.
Complex Notation and its Application to RLC circuits. Resonance, Q-factor, impedance and power P,S, and Q.3 phaser, delta and star conversion line and phase voltage.
Complex Notation and its Application to RLC circuits, Resonance, a-factor, impedance and admittance power, P,S,G. Introduction to D.C. Machines, A.C. Machines and Transformers.

EEG 203 – SIGNALS AND SYSTEMS (SIGNAL THEORY)

Continuous and discrete signals, transformatisons and inverse transformations, spectral analysis of steps, ramps and impulse, signal descriptions by impulse and step functions.
The independent variable; Definitions of rise-time, settling time, overshoot, period magnitude and duration of a signal.
Fourier Analysis, Perseval Theorem
Periodic and Non-Periodic signals.
Devices and Models
Network analysis and circuit with independent and dependent sources.
Time invariant and stationary systems.

EEG 204 – INTRODUCTION TO SWITCHING AND LOGIC SYSTEMS

Number systems conversion between bases, Arithmetic with bases other than ten, 1 and 2s complement, BCD, weighted and unweighted codes; Gray codes.
Truth Function and Truth False
Boolean Algebra and De-Morgan theorem. Truth function set or Venn diagram and truth tables. Minimization of Boolean function; using Boolean Algebra and Karnaught Map (K-Map).
Switching Devices: Switches Relays, logic circuits. Realization of simple combinatorial circuit, binary single bit address, simple code conversion, bit comparators. Introduction to multivibrator circuits; Astable, Monostable and bisable.

EEG 205 – PHYSICAL ELECTRONICS

Electrons and hole, carrier motion in semiconductors. Principles of Semiconductor devices. Introduction to Microwave semiconductor devices, LED, LCD, and other optical devices. Introduction to lasers and masers. Introduction to microelectronics and IC Technology.

EEG 207 – ELECTRICAL SYSTEM GRAPHIC

Software tools for computer graphics, analytic geometry and computer graphics. Basics of 3-D graphics. Hidden line and Hidden surface routines. Graphic theory. Stimulation of circuit elements, devices and components. Simulation of Electronics circuits.

EEG 210 – ELECTRICAL ENGINEERING MATERIALS

Introduction to Quantum and Statistical Mechanism. Structure of Solid. Electrons in solids. Dielectric Properties. Polarization, frequency responses. Derby equation. Electrical properties – Breakdown, piezo and Ferro-electric effect. Magnetic Properties – Physics of magnetic materials. Atomic moment, The transition elements. Magnetic alloys. Ferrites. Thermal properties of materials. Optical properties of Materials. Introduction to Transducers.

EEG 301 – CIRCUITS AND SYSTEM I

Network Theorems, circuit graphic. Elementary signals. Dynamic circuit elements. First and second order differential equations. Time domain solution of circuit equations. Impulse response. Network functions. Natural frequencies of networks. Convoltion and some of its applications. Network equivalences. Introduction to the concept of auto-and cross correlation. Sinusoidal steady state analysis.

EEG 302 – CIRCUIT AND SYSTEMS II PRE-REQUISITES EEG 201 AND 203

Periodic and non-periodic signals. Harmonic analysis. Fourier series and Fourier Integral. Spectral analysis. Laplace Transformation. Network functions. Network analysis using Lapplace transform and Fourier transform methods.

EEG 303 – POWER ELECTRONICS

Electronics for high-power control. Amplification using Pulse Width Modulation (PWM) Comparison of the power transistor with the thyristor Design and Construction of thyristors for high currents and voltages. Cooling and protection of high-power semiconductors Design of firing circuits, oscillations, blocking-oscillators transistor-inverters. A.C commulated converters, one-two- and four-quadrant operation, rectification, inversion.

Distortion and Non-Linear Operation: Class A, AB, and C operations. Class C Tunes amplifiers. Optical Devices and photo electronics. Pulse circuits, sequential circuits, RS, JK, D and T. Diodes and Transistors Logic circuits.

EEG 306 – ELECTRONICS CIRCUITS II

Tuned and Feedback amplifiers. Stability. Unilaterilisation, impedance matching. Direct-coupled multistage amplifier, difference. Cascade and Darlington circuits. High and low frequency response. Operational and wave form generators. Temperature controllers. Noise in electronic circuits. Special circuits; voltage controlled and sweep oscillators, phase locked loops.

EEG 307 – ENERGY CONVERSION

Electromechanical Energy Conversion:

Single and double coil devices, concentrate3d and distributed windings, mmf patterns in air-gap torque and induced voltage analysis, constructional features of synchronous; induction and D.C. machines.

Direct Energy Conversion:

The solar cell, thermo-electric energy conversion, the fuel cell MHD energy conversion. Power transformers. Phasor diagrams and equivalent circuits, regulations and efficiency calculations and measurements, three-phase transformers parallel operation of transformers.

Other types of transformers: auto transformers and instrument transformers. Per unit system of calculation. Transformer Design.
Small A.C. Motors.
The single phase or induction motor-principle. The split-phase induction motor, Capacitor start induction motor, the shaded-pole motor. The single-phase series motor.

EEG 309 – MEASUREMENT AND INSTRUMENTATION I
Use of CRO in electronic/electrical measurements. Digital methods for measurement of physical qualities. Transducers Analog electronic instruments for voltage, power wave-form, frequency and phase measurements. Digital instrumentation. Theory of errors. Absolute and relative treatment of errors. Moving iron, moving coil, thermals electrostatic and induction type instruments.

EEG 310 – ELECTRICAL DRIVE
Drive Components and Principles:
Armature volts and Ward Leonard speed control schemes. Torque and speed control. The thyristor-models, characteristics, turn on and turn off requirements. Natural and forced communication. Introduction of Ac/DC, AC/AC and DC/DC conversion.
Industrial Drives:
Choice of an electric motor for industrial drive. Specification of control system, duty performance, criteria, motor dynamic. Control characteristics of the shunt motor, two-phase servo motor, stepped motor, stepper motor, matching motor and gearless system, motor enclosure, motor rating. Block diagram and models of electric Drives.
Power Control Devices:
Operational amplifiers and thyristors, A.C. & D.C. Generator transfer functions, power gain/time-constant, analogue and digital transducers for speed and position management. Block Diagram of Industrial drives.

EEG 312 – INSTRUMENTATION II
Transducer, digital instruments, curve tracers, recorders, measurement of temperature, displacement magnetic ratio and multiple ratio measurements. Data conversion and interfacing. Data loggin switches and displays. Data Acquisition Systems, software Data Conversion. Multiplexing Spatrac Encoders, Errors.

EEG 314 – PULSE AND DIGITAL ELECTRONICS
Review of Boolean Algebra and Logic Circuit
Review of number systems and Logic codes
Minimisation of Boolean functions, Map and Tabular Methods
Combinational Logic systems, elements, Adders, Code Converters Encoders and Decodes, Multiplexers, demultiplexers PLAS, Error Detecting and Correcting codes. Parity checkers.
Sequential Logic systems elements, flips – flops and their transition clock mode and pulse mode circuits. Designs of Synchronous sequential logic system.
Counters, Registers, Sequence Generators.
Logical Design using MSI, LSI and VLSI part.
Memories and their realization.
ROMS – PROM, EPROM, EEPROM
RAMS – SRAM, DRAM
Magnetic Memories – HD, FD CD, Tapes etc.
Bipolar and MOS Technologies

TTL, ECL, COSMOS, P-MOS, N-MOS Totem Pole, Tri-state and open collector Logic elements Properties:- Fan-out, fan-in, Noise margin, propagation, delay and switching speed.
MSI, LSI,ULSI technologies
Interfaces and converters
Serial-Parallel converters
Analogue – digital and digital-Analogue converters sample and Hold, successive approx.
R-2R ladder networks etc.
TTL – MOS – Interfaces

Pre-requisite : EEG 305

EEG 401 – MICROPROCESSORS AND MICROCOMPUTERS
History of digital computers and microcomputers, Microprocessor preliminaries, Microprocessor in system design. Basic digital building block – Register, Counter, Clocks etc. Microprocessor hardware, Algorithms and their suitability for microprocessor implementation, Microprocessor software, Microprocessor applications.

EEG 403 – COMMUNICATIONS SYSTEMS
Spectral Analysis, Auto-correlation, Weiner-Khinchines theorem, Amplitude Modulation, Modulators and Demodulators. Angle, Phase and Frequency Modulation. The sampling theorem, Pulse Modulation, PAM, PWM, PPM. Propagation of Radio Waves, Multipath transmission. Introduction to Noise Remote Control and supervisory systems.

EEG 405 – CLASSICAL CONTROL SYSTEMS ANALYSIS
Modeling of physical systems, Dynamic equation of mechanical, electrical, thermal and fluid flow systems. Transfer functions of mechanical, electrical and electromechanical control components. Block diagrams Signals flow graphs. Characteristic equations, s-plane roots, and stability. Performance criteria. Roots locus, polar and Bode plats. M- and N- diagrams. Inverse Nyquist plots. State space description of control systems, analogue computer simulation of control systems.

EEG 407 – INTRODUCTION TO COMPUTERS
Principle of analogue computing. Linear computer units – summer. Integrators/Differentiators. Non-linear operators, operational amplifiers. Solution to some differential equations. Block diagram of a simple one-address machine. Function of the store, arithmetic and control unit. Computer architecture. On-line operation and data high-ways. Computer programming, assembly language, systems software.

EEG 409 – POWER TRANMISSION AND DISTRIBUTION
Electrical parameters. Long line equations, analytical and graphical methods of solution for short and long lines. Performance charts. Application of Matrix Methods. Circle diagrams and power limits of uniform long lines. Reactive Power Compensation. Insulators and voltage distribution. Conductor materials and configurations. Sag and Tension Calculations.

EEG 411 – ELECTRICAL MACHINES THEORY
Three-phase synchronous machines, generation of three-phase power. Equivalent circuit Linear and non-linear machine analysis. Parallel operation. Operating Charts of synchronous motor starting and performance. V. Curves, power factor control. Three phase diagram. Torque/speed characteristics, speed control. Starting Induction regulators. Fractional-horsepower motors.

EEG 415 – ELECTROMAGNETIC WAVES THEORY
Scalar, Vector and Hertsian potentials for solving Maxwell's equations. Plane waves in free-space. Poynting Vector. Plane waves in conducting and dielectric media. Skin effect, Guided waves. Waveguide structures, Cavity resonators. The scattering of electromagnetic waves.

GEG 501 – ENGINEERING ECONOMICS
Project development and financial analysis
Market analysis and demand estimation
Investigation and technical aspect of project development and financial analysis
Criteria for Project Choice
Project Financing
Determination of Economic and Social profitability

GEG 502 - ENGINEERING MANAGEMENT
PART 1 - CONTRACT. (LAW)

Definition of a Contract
Classification of a contract
Ingredient of a valid contract
Elements of a Contract
Consideration
Intention to create legal relation
Capacity of a contract
Consent of a party
Concept of brevity of a contract and its exceptions.
Mistakes of a Contract
Duress in a contract
Undue influence in a contract
Misrepresentation a contract
Illegality in a contract
Discharge of a Contract
How does a contract come to an end
Remedies for breach of a contract

PART 2 - MANAGEMENT
Introduction to Management
Decision Analysis
How to model a decision situation
Quantitative techniques for situations of uncertainty.
Decision tree
Project Management
Project evaluation and review techniques
Concept of Motivation
Theories of motivation
Hertzberg 2 factor theory
Transportation Management Model.

EEG 501 – POWER SYSTEMS ANALYSIS
Power systems representation. Per-unit systems. Load-flow analysis and the use of digital computers. Short-circuit current and reactance of synchronous machines, three phase, symmetrical component theory and unbalanced fault analysis. Steady and transient stability the swing equation and equal area criterion.

EEG 502 – DIGITAL COMPUTER DESIGN
Hardware design of digital computers. Arithmetic and logic unit, adder, multipliers, dividers, logic and sifting operations. Floating point arithmetic. Memory organization, design of a basic computer. Instruction set, structure. Fetch-execute micro-operations, hardwired control unit, microprogrammed control unit. Index registered addressing, interrupt operation, direct memory access. Organisation of commercially available computers.

EEG 503 – COMMUNICATION SYSTEMS

Binary PCM, FSK, DPSK. Data Transmission. Multiple Access Techniques Matched filter reception. Information and Coding theory. Error Correcting Codes. The syndrome. Noise in Digital communications Systems. Introduction to satellite communication.

EEG 504 – POWER SYSTEMS PROTECTION
The concept of protective relaying in power systems. Distance relaying. Differential relaying protective systems in generators, motors, busbars and transformers. Basic principles of relay design, construction, characteristics, applications and testing. Prerequisites: EEG 409.

EEG 505 – SYNTHESIS AND ESIGN OF CONTROL SYSTEMS
Integral, proportional and derivative control actions, three term controllers. Lead, lag compensators, controllability and observability. Introduction to optimal control, pole assignment, and state estimation. Digital computer simulation. Non-linearities in control.

EEG 506 - ELECTRICAL MACHINE DESIGN
Principles of electrical machines and design. The output equation, the calculation of machine parameters, saturation problems in machine design. Specific electric and magnetic loading related to cooling of machines. Specific design problems and computer-aided design of electrical machines. Definition and classification of windings: Coil construction and insulation, physical problems connected with single and double layer-winding; voltage analysis of 3-winding symmetrization.

EEG 507 – HIGH POWER ENGINEERING I
Generation of high A.C., D.C. and Impulse voltages. High voltage measuring methods. Fundamental processes of electrical discharges. Breakdown mechanisms in gases. Influence of type of voltage, electrode configuration, distance, temperature, pressure and humidity on the characteristics of discharges and breakdowns. Electric filed calculations for different electrode configurations.
Generation and measurement of high currents. Thermal losses due to high currents. High impulse currents. Technical losses in power networks due to high currents. Compatibility issues. Prerequisite: EEG 307

EGG 510 – ENERGY MANAGEMENT AND POWER QUALITY ASSESSMENT
Energy needs of Nigeria. Energy Conservation. Energy Management. Energy Auditing.
Power Quality: Definitions: Voltage Dips, (SAGS). Brief Interruption, SWELLS, Transients, Voltage fluctuations. Flickers, (causes and effect). Quality assessment. Notches, Harmonics, Inter-harmonics, Voltage unbalance.
Power Assessment under waveform Distortion: Single phase definitions examples, Three phase definitions examples. Power quality monitoring. Prerequisites: EEG 501

EEG 511 – POWER SYSTEMS ECONOMICS AND OPERATION
Component of power generating systems. Type of stations, Voltage and frequency control design and organization. Load curve studies. Economic principles. Cost equations. Economic operation of generating plants. Effects of transmission on economy of systems. Electrical load development. Tariffs. Load duration curves. Effects of power factor on plant economy. Prerequisites: EEG 409.

EGG 512 – DIGITAL CONTROL SYSTEM AND DIGITAL SIGNAL PROCESSING
Sampled data systems. Block diagrams. Characteristic roots in the Z-plane. Stability of digital control systems. Direct Digital design. Digitalization of analog designs. Digital state space

formulation and solution of the state equations. Introduction to microcontroller and microprocessor based control systems implementation.
Microcontroller Implementation of Filters. Architecture issues, single chip programmable digital processors. Programming methods, languages, data representations, Optimizing for speed, optimizing for size, flooby dust on programming. Finite word-length effects: co-efficient quantization. Limit cycles FIIR filter implementation. IIR Filter implementation.
Examples: Implementing DFT, DFT to FFT. The Goertzel Algorithm: Implementation of the FFT on the 68 HC 16 Code. Prerequisites: EEG 505.

EEG 515 – INTRODUCTION TO VLSI SYSTEMS DESIGN
What is VLSI Technology? MOS transistor Theory., Inverter Circuits. Data and Control flow. MOS processing and design rules. Integration and system fabrication. Logic Design with MOS. Architecture and Design of System Fabrication. Logic with MOS, architecture and design of systems controllers, system timing. Highly concurrent systems and their suitability for VLSI implementation, signal processing using MUS VLSI technology, systems, computational aspects of VLSI. Prerequisites: EEG 306.

EEG 516 – ANTENNAS AND PROPAGATION
Theory of Dipole. Antenna Arrays. Linear, loop, helical, biconical and Aperture Antennas. Elements of Beam shaping. Slot, horn reflector and lens Antennas. Antenna Gain directivity and effective aperture. Ground, sky and space wave propagation. Lonospeheric propagation, Multi-path phenomena Signal loss and Fading, Antennas for space communications. Prerequisites: EEG 401.

EEG 517 – MICROCOMPUTER GRAPHICS
Geometry and Line Generation, Graphics Primitives. Polygons. Fundamentals: homogeneous coordinates 2D and 3D geometric transformations and perspective. Segments. Clipping and windowing, scene modeling and animation. Algorithms for visible surface determination hidden line and surface elimination.

EEG 518 – MICROWAVE OPTICS
Fundamental laws of electrodynamics, energy, force and momentum, scattering and dispersion, interior boundary value problems. Geometrical optics (G.O), physical optics (P.O.),. Aperture radiation integrals. Minimum range requirements. Stationary phase, sidelobes, backlobes, aperture blocking, radar echo area, geometrical theory of diffraction gyrotropic media. Prerequisites: EEG 509.

EEG 519 – POWER SYSTEMS DESIGN, PLANNING AND EQUIPMENT
Power system planning and design: world energy resources. Methods of electrical generation. Load forecasting and source analysis. Principles and practice of HVAC transmission and distribution. Mathematical methods used in planning of source utilization and transmission networks. Generation scheduling. Power system equipment: Alternators, Factors affecting size and design, specials problems of turbo – and hydro-alternator construction and operation. Transformer – design, construction and operation Switchgear. Principle of circuit breaking, types layout of substation. Overhead lines and cables. Fabrication, erection and use. Prerequisites: EEG 409

EEG 520 – HIGH POWER ENGINEERING II

Breakdown in solid and liquid dielectrics. Circuit interruption. Arc extinction. Transient Recovery voltages. Switchgear construction, oil switches. Minimum oil breakers, air blast and SF6 types. Arc-extinguishing devices. Resistance switching. Introduction to conducting, magnetic and insulating materials such as ceramics etc. Structure and properties of thin films; electronic transportation. Principle of solid, characteristics of dielectric materials, conducting materials and introduction to super-conductivity. Theoretical and experimental magnetism. Preparation and properties of materials. Prerequisites: EEG 507.

EEG 525 – TELEPHONE AND FACSIMILE SYSTEMS

The telephone system and conventional Telephone sets. Speech-dialing, and ringing-circuits. Basic traffic Theory Digital Transmission Techniques. The Central office Basics of the External line Plant Design and Installation digital Switches. Wireless Telephone MODEMS and FAX Advances in modern telephone systems Machines.

POSTGRADUATE DEGREE PROGRAMME
DEPARTMENT OF ELECTRICAL ELECTRONICS

UNIVERSITY OF LAGOS

1. INTRODUCTION

The postgraduate programmes of the Department of Electric-al Engineering are directed towards providing basic and applied research opportunities relevant to the processing of electrical energy and information.

Consequently, the department's higher degree programmes have the twin objectives of offering postgraduate courses and basic research in specialized areas of Electrical and Electronic Engineering and secondly, updating, as the need arises, the knowledge of practicing engineers and applied scientists in specialised fields of Electrical and Electronic Engineering, through industry oriented and application-specific research programmes.

2. AREAS OF SPEaALIZA TION

Programmes shall be offered for courses and research in the following areas of specialization:

(i) Electrical Machines, Power Engineering and High-Voltage Techniques
(ii) Electrical and Control Engineering
(iii) Electrical and Communication Engineering

3. FACILITIE;SAVAILABLE FOR RESEARCH . .;;3,

Research may be carried out in any of the areas listed under paragraph 2. -There are reasonably well-equipped Electrical Machines Laboratory, High- Voltage Laboratory (capable of test voltage up to 1 million volts) Control Laboratory, Electronics Laboratory and Communication Laboratory. The Computer Centre of the University possesses several PC's for use of staff and students, and there are plans for the centre to purchase in addition to an advanced mini-computer purely for scientific research purpose. In addition to the facilities available in the Faculty's NIGERDOCK COMPUTER CENTRE, some PC's are available in the department for the use of students and lecturers.

4. ADMISS|ON REQUIREMENTS

All the prevailing university regulations governing postgraduate degree shall apply.

MASTER OF SCENCE (M.Sc.) IN ELECTRICAL ENGINEERING

Introduction:

This programme is to last for 12 calendar months for full-time students. It consists of eight courses, one of which shall be a research project. The units for each course are as laid down below. The research project shall be four units. Apart from the research project which shall last throughout the calendar year a number of courses shall be available during the first semester while the rest shall be available in the second semester.

Admission requirements .

(i) The programme shall be open to candidate with a Bachelor's degree or equivalent in Electrical or Electronic Engineering of the University of Lagos or any other approved University

ii Candidates may be required to satisfy the department in a selection process involving written examinations.

Degree Requirements

To obtain an M.Sc. in Electrical Engineering, candidate must:

(iii) Satisfy the examiners in a minimum of 24 units, made up as follows:

(a) 10 units Gfthe compulsory courses

(b) 10 units from the optional courses

(c) 4 units of the "Research Project" course

(iv) Satisfy all other requirements as stipulated in the Regulations of the School of Postgraduate Studies.

B. MASTER OF PHILOSOPHY (M.PHIL) AND DOCTOR OF PHILOSOPHY (PH.D.) IN ELECTRICAL ENGINEERING

Introduction:

These programme are designed for candidates wishing to do original postgraduate research in Electrical Engineering. Candidates are expected to take and pass a 1st year coursework of a minimum of 30 units unless they already possess the M.Sc. or equivalent in Electrical Engineering of the University of Lagos or any other approved University.

Admission Requirements .

(i) The M.Phii. programme shall be open tocandidates having:

(a) a Bachelor's degree or equivalent in Electrical Engineering with a minimum of 2nd Class (Upper);

The Ph.D. programme shall be open only to candidates having an M.Phil. or equivalent in Electrical Engineering.

Candidates for either the M.Phil. or Ph.D. programme may be required to satisfy the department in an interview or written examination or both.

M.Phii. Degree Requirements

To obtain an M.Phii in electrical Engineering, unless he already has an M.Sc. in electrical engineering and therefore requires to satisfy only a minimum of six units at the 900level, a candidate must:

Satisfy a minimum of 30 units, made up of the following:

(a) 10 units of the compulsory courses

(b) 10 units from the optional courses

(c) four units ofthe "Selected Topics in current Electrical Engineering Research" course.

(d) six units of the "Research Seminars" courses at the 900-level..

Satisfy all other existing requirements as stipulated in the Regulations of the School of Postgraduate studies

Ph.D. Degree Requirements

To obtain a Ph.D. in electrical Engineering, a candidate must:

(i) Satisfy a minimum of six units of the "Research Seminars" at the 950-level (ii) Satisfy all other requirements as stipulated in the regulations of the School of Postgraduate Studies.

PROGRAMME STRUCTURE

M.Sc.jM.Phil. Courses
Compulsory Courses

Course Code	Course Title	
EAG 800:	Numerical Methods in Engineering	2
EAG 803:	Methods of Applied Mathematics	3
EEG801:	Mini-Project	3
EEG 802:	Computer-Aided Design Techniques	3
EEG 803:	M.Sc. Research Project	3

OPTIONAl COURSES
Specialising in Electrical Power Engineering and High Voltage Engineering

Course Code	Course Title	No of Units
EEG 804:	Electrical Power systems and Control	3
EEG 805:	High Voltage Engineering	3
EEG 806:	Projective Systems	3
EEG 807:	Rotating Machines	3

Specialising in Electronics and Communication Engineering

Course Code	Course Title	
EGG 808:	Electronic Device Models & CircuitDesign	3
EEG 809:	Active Networks	3
EEG 810:	Analysis and Synthesis of Active Network	3
EEG 811:	Speech Analysis and Synthesis	3
EEG 812:	Digital Signal Processing	3
EEG 813:	Information Theory and Coding	3
EGG 814:	Electromagnetic Theory	3
EEG 815:	Microwave Engineering and Antennas	3
EEG 816:	Radio Wave Propagation	3
EGG 817:	Digital Computer Design	3
EGG 818:	Biomecial Electronics	3

Specialising in Electronics and Control Engineering

Course Code	Course Title	
EEG 819	Classical Control Theory: Analysis and Design of control Systems	3
EEG 820	Sampled Data and Digital Control Systems: Analysis and Design	3
EEG 821	Analysis and Design and Linear Multi Variable Control Systems	3
EEG 822:	Introduction to Stochastic and Adaptive Control	3

M.Phil. Courses	Course Title	
EEG 901:	Selected topics in current electrical and and Electronic Engineering	4
EEG 902	Research Seminar I	3
EEG 903	Research Seminar II	3

Ph.D. Courses

Course Code	Course Title	
EEG 951:	Research Seminar III	3
EEG 952:	Research Seminar IV	3

6. DESCRIPTION OF COURSES

EEG 800: Numerical Methods in Engineering I 3units

Methods for obtaining numerical Solutions to problems arising in Engineering. Linear and NonlinearMechanical systems. Ordinary and partial Differential equations, Initial value and extreme value problems.

EAG 803: Methods of Applied Mathematics II 3units

Partial Differential Equations; Green's Functions; Fourier and Laplace Transforms; Complex Variables;Tensor Analysis Applications, .

EEG 801: Mini-Project 3units

In this course, all M.Sc. students are encouraged to Undertake laboratory design oriented miniproject in the first semester under the supervision of one or more members of the academic staff of the department.

EEG 802: Computer-Aided Design Techniques 3units

Computer' added analysis of electrical and electronic ecesis and compori'ents. Network topology, compute formulation of Kirchhoffs Laws, Nodal analysis of linear and non-linear networks; computer formulationof the frequency domain solutions, stability and sensitivity evaluation. Computer-Aided numerical analytical tools for electronic and electrical Engineering.

EEG 803: M.Sc. Research Project 3units

Applications of research techniques to the solution of current electrical and electronic engineering problems as directed by A competent supervisor. Projects bordering on development of research methodologies. Projects on the problems of local industry and materials as well as of tropical environmental importance. Student is expected to give a seminar on the M.sc. research project.

EEG 804: Electrical Power systwms and Control 4units

Network Analysis, load flow analysis, Optimal Systems Operation, Techniques of power of systems control, Power System Stability, Power System Economy, Load Forecasting, Computational Methods and Programming.

EEG 80S: High Voltage Engineering 3units

Properties of dielectrics, Ionization processes and gas breakdown of Solid and Liquid Dielectrics, Electrostatic fields, Surge phenomena, Insulation Coordination, Insulation in Polluted atmospheres. Corona and interference from power Systems, TechQiques of H,V. tests and specifications, H,V. dc Conversion and transmission,

EEG 806: Protective Systems 3 units

Voltage and current transducer Power fault analysis construction and characteristics of protective relays Protection of A.C Machinery, Feeder Protection, Bus-zone protection,

Back-up Protection, static relays, Overvoltage protection, Theory of Interruption. Switchgear design, Recovery Voltage transients.

EEG 807: Rotating Machines Analysis 3 units

The idealised machine, sign convictions and the per unit System. MMF and Flux in the Rotating Machine. Assumption in the General theory of Electrical Machines. Methods of Analysis of Machines. The D. C. Machine Inter_e, compensating and series windings Transient performance of the D.c. Machine. Steady State Vector Diagrams for A.c., Machine. General Equations for A.c. Machine. Steady State Operation and characteristics. Symmetrical short circuit of An Alternator. Synchronising phenomena and sustained Oscillations in synchronous Machines

EEG 808: Electronic Device Models and Circuit Design 3 units

The principles, structure and characteristics of semiconductor Devices; simple-frequency models for transistors: small signal and wide-band models for general nonreciprocal devices hybird - PI and Tee models for transistors; relationship of models to transistor physics. Comparison of bipolar and Field effect transistors; detailed
frequency response of simple and multistage amplifers, design of feedback amplifers, D.c. coupling techniques, design of multistage"tuned amplifiers Selected digital and analogue circuits Operational Amplifiers and applications. Integrated circuit design.

EEG 809 Active Networks.

Active network modelUng 1he complex frequency plane, Conventional feedback and sensitivity, theorems for feedback Circuits, stability and physical reliability of electrical networks, Nyquist's and Routh's criteria for stability: Activity and Passivity Criteria. Examples using Op-Amps, FDNR's converters, grators, Nullators, etc.

EEG 810: Analysis and Synthesis of Passive Networks 3units

Geometrical and analytical description of networks. State Variable characterizations: scattering matrics, signal flow graphs: Sensitivity. Design of driving-point and transfer impedance Functions with emphasis on the transfer loss and phase of minimum Phase networks, flow diagram, physical network characteristics, Including relations existing between real and imaginary components of network functions, modern methods of network synthesis.

EEG 811: Speech Analysis and Synthesis 3units

Acoustic theory of speech production; speech signals processing, Digital models and time domain models of speech signals;' Digital speech processing for man-machine communication. Realization of voice response and Speaker recognition systems.

EEG 812: Digital Signal Processing 3 units

Sampling as a modulation process, the sam'pling theorem: the Z-transform and discrete-time system analysis, direct and computer- Aided design of recursive and non recursive digital filters: the Discrete Fourier transform (DFT) and the Fast Fourier transform (FFT), digital filtering using the FFT, analogue-to-digital and digital-to-analogue conversion; effects of quantization and finite-word-length arithmetic. Correlation functions and power spectral densities for discrete time filters, methods for descrete time whiner filters, methods for designing digital filters to meet precise frequency domain specification.

EEG 813: Information Theory 3units

Information measure, entrophy, mutual information, source encoding; noiseless coding theorem, noisy coding theorem; exponential error bounds; introduction to probalilistic error correcting codes, block and convocational codes, block and convocational codes and error bounds; channels with memory; continuous channels, rate distortion function Introduction to coding and brief review of modern algebra (vectors, spaces and Galois fields); theory of linear codes; decoding hamming, cyclic and Bose-Chandhuri codes, error detecting and correcting coded; simple automatic fault diagnoing techniques.

EEG 814: Electromagnetic Theory

Theoretical analysis and engineering applications of Maxwell's Equations. Boundary value problems of electro statistics and Magnetostatics. The homogeneous wave equation. Plane wave Propagation. The interaction of place waves and material media. Retarded potentials. The Hertz potential. Simple radiating systems. Relativistic covariance of Maxwell's equations.

EEG 815: Microwave Engineering and Antennas 3 UNITS

Mathematical methods for the solution of wave equation; Transmission lines and waveguides, selected topics in the Theory of wave guide structures, surface guides and artificial Dielectrics. Introduction to the concepts of radiation, generalized for field Formulas. Antenna theorems and fundamentals. Radiative Networks. Antenna arrays, linear and planner arrqys; aper Antennas; terminal impedance, propagation. Selected advance Topics. .

EEG 816: Radio Wave Propagation 3 UNITS

General Solutions of Maxwell's equations, geometrical optics Approximations, propagation above a place earth, effects of surface irregularities and stratified atmospheres, scattering by tubulence.

EEG 817: Digital Computer Design 3UNITS

Essential elements of the hardware design of digital computers. Arithmetic and logic units, adders, multipliers, dividers, logic and shifting operations, floating point arithmetic. Memory Organisation, digital memories. Hard-wired control unit, microProgrammed control unit, index registers. Organization of commercially available computers. Design of basic computer.

EEG 818: Biomedical Electronics 3 UNITS

Introduction to the generation and processing of bio-electric Signals induding structure and function of the neuron Generation and propagation of nerve impulses, electronic Neutral-type systems and heir realization. Biological and Medical instruments and equipments. Application in the Design of hearing aids for the deaf and of cardinal pace makers, or a similar case study.

EEG 819: Classical control Theory: Analysis and Design of Control Systems: 3 UNITS

Survey of basic principles of linear control theory. Feedback Control. Stability criteria. Performance criteria. Principles of Servos and controllers, equations of a basic servo; specifications And their implications. Graphical methods of design: Root locus, Bode diagrams Nicholas chart compensation in time and Frequency Domain.

Non-linearities and their effect on system performance. Describing function principles; examples illustrating stability situations, stable and unstable limit cycles, methods to eliminate oscillations, frequency response calculations. Phase plane princIples,; application to control systems, relay operated systems; optimum switched and dual mode systems. Popov stability criteria.

EEG 820: **Sampled Data and digital Control Systems Analysis and Design3 UNITS**
Sampling analogue conversion. Z-transformationand modified Z-transformation, Frequency analysis of sampled data systems. Discrete system state space representation and stability; Z-transfer Function from discrete state space representation poles of discrete System transfer function. Z-transfer function of discrete systems From the transfer function of the continuous system. Stability analysis of sample data systems. The bilinear transformation. Aplication of Routh-Hurwitz stability criterion to sampled-data Systems. Root-locus method, Realisation of compensation networks.

EEG 821: **Analysis and Design of Linear Multivariable Control systems 3 UNITS**
Systems representation. Problems of interaction in control system Design. Design on a single loop basis. Non-interacting. Control Diagonal dominance. Assessment of MIMO system stability. Characteristic loci, Nyquist and Inverse Nyquist methods, Gershgorin And Ostrowski Circles MIMO Contrql system design approach. Industrial Application examples.

EEG 822: Introduction to Stochastic and Adaptive Control 3 units
Stochastic processes in discrete and continuous time. Stationary Processes:- auto correlation and cross correlation. Spectral density functions, with noise. Linear operations, on stationary processes. Difference equation models for discrete-time processes. Identification of linear discrete-time systems from input-output data; Parameter Estimation, Identification of model structure, general Disgnostic methods. Adaptive control; Minimum Variance. Self-Turning Control (Astrom). Self-turning controllers for deterministic Systems. Model reference adaptive controllers applications.

EEG 901: Selected Topics in Current Electrical and Electronic Engineering
Selected topics of current research in power, high voltage, Electronics, control, communication and antennas, etc will be presented by senior academic memben;' of staff. The format will include lecturers and stu.dent preparation and presentation of two major review papers for evaluation.

EEG 902& 903: Research Seminars I & II 4unil:$,
Candidates will be required to make at least two seminar presentations on their, M.Phii Research Topic. Each candidate will be required to produce a manuscript in the usual journal format on the topic under investigation. For these candidates, literature review and/or development or relevant mathematical models related to dissertation topics will be acceptable.

EEG 951 & 952: Research Seminars III and IV 3units
The format will be similar to the Research seminars I and III for The M.Phil, except that more emphasis will be on the actual Results of the student's Ph.D. research work.