



Ministry of Higher Education and Scientific Research
University of Mosul- Collage of Engineering



Electrical Engineering Department

B.Sc. CURRICULUM COURSES

College of Engineering / Electric Engineering Dept. / First Class

Course No.	Subject	First Term			Second Term			Unit No.
		Theo	Pract	App.	Theo	Pract	App.	
EE 101	Human Rights and Democracy	1	-	-	1	-	-	2
EE102	Digital Techniques	2	-	1	2	-	1	4
EE 103	Engineering Drawing	-	3	-	-	3	-	2
EE 104	Computer Science	2	2	-	2	2	-	6
EE 105	Principle of Mechanical Eng.	3	-	-	3	-	-	6
EE 106	Mathematics	3	-	1	3	-	1	6
EE 107	Electronics Physics	2	-	1	2	-	1	4
EE 108	Basics of Electrical Eng.	3	-	1	3	-	1	6
EE 109	Laboratories	-	3	-	-	3	-	2
EE 110	Arabic Language	1	-	-	1	-	-	
Total		17	8	4	17	8	4	40
		29			29			

EE 101 Human Rights and Democracy (1/-/-)

Human rights in the constitutional documents, human rights in the international documents, succession in the earth and human dignity, political and social rights of human in the Islamic law the duties of the government to protect these rights correctly, social, cultural and economic rights, safeguards to prevent abuse of human rights, definition of democracy, models of democracy, the democracy and the state management.

EE 102 Digital Techniques (2/-/1)

Introduction to Digital Technique, Basic Definitions, System of Numbers, General number formula: Binary, octal, decimal & hexadecimal numbers, Numbers Base Conversion (Arithmetic operation in different numbers complements, binary codes, BCD, Ex-3, gray codes), Boolean algebra: (Basic definitions, basic theorem & properties, Boolean functions), Canonical & Standard Forms Digital Logic Gates, Karaniugh Maps (AND & OR implementation, don't care condition), Adders Arithmetic Operation (Sub tractors, half & full adders & Subtractors, binary parallel adders), Code Conversion (Even and odd parity logic, decoders, encoders comparator, multiplexers & demultiplexers), Sequential Logic (Flip Flops (RS, T, D, JK...) Master slave FF, Counters, Shift registers).

EE 103 Engineering Drawing (-/3/-)

Drawing: Engineering Instruments, Lettering, Orthographic Projection, Graphic Geometry, Dimensions, Isometric Drawing.

Auto-CAD Drawing: Introduction to Auto CAD, Dimension Units Commands, Drawing Commands, Drawing Files, T- Text Commands.

EE 104 Computer Science (2/2/-)

Computer Unit Definition and Functions, Introduction to Operating System, MSDOS & Windows, Introduction to Microsoft Offices, Algorithms, Flowcharts and examples, Programming Language (Constants & Variables, Statements: input, output, Conditional Statements, Assignments, Looping, One Dimensional & Two Dimensional Arrays, Functions, Applications .

EE 105 Principle of Mechanical Eng. (3/-/-)

Static: Force system, Units system, Forces + Components, Resultant, Moment and Couples, Equilibrium, Centroid, Moment of Inertia, Friction.

Dynamics: Rectilinear motion, Curvilinear motion, Projectile, Circular motion, Acceleration Components (Rectangular Comp., Normal Tangential Comp.), Kinetic -2nd Law of Newton. Thermodynamics: Properties of Substance, Pressure and Temperature, Work and Energy, Ideal Gas, First Law of Thermodynamics, 2nd Law of Thermodynamics. Strength of Material: Stress and Strain, Hook's law, Modulus of Elasticity, Shear Stress.

EE 106 Mathematics I (3/-/1)

Brief Review: about differentiation and integration law, Transcendental Functions: studying Definitions, Properties, Graphs, and differentiations of the following Transcendental functions: natural logarithm. The exponential function e^x . The logarithm to the base a . The exponential function a^x . The inverse trigonometric functions. The hyperbolic functions. Inverse hyperbolic function. Applications of definite integral: Area between curves. Volume of solid revolution. Arc length of a plane curve. Surface area of arc length revolution. Methods of integration: Trigonometric substitutions. Partial fractions. Integration by parts. Further substitutions. Vectors algebra: Representation of vectors in plane and space, unit vectors, scalar product, vector product. Polar coordinates system: Polar coordinates system and the graphs of polar equations, plane area in polar coordinates, arc length of curves in polar coordinates. Determinates and matrices: Definitions and properties of them, the method of finding the value of the determinant, solution of simultaneous linear equations by determinants (Cramer's Rule), the method of finding the inverse of a square matrix, solution of simultaneous linear equations by matrix method. Numerical integration: Simpson's approximation methods. Limit: L'Hopital method and its applications. First order differential equations: variable separable differential equations. Homogeneous differential equations. Linear differential equations. Exact differential equations.

EE 107 Electronics Physics (2/-/1)

Energy Level and Atomic Structure: The atom, models, wave nature of light, dual nature of matter, energy-band theory of metals, insulators and semiconductors, crystal structure, ionic, covalent and metallic bonding, energy band of crystals, Internal structure of materials cell, packing miller indices, crystal planes and directions. Electrical Conduction in Metals: Mobility and conductivity, energy distribution of electrons, Fermi levels, work function, Electronic emission. Semiconductors: Semiconductors materials (Si, Ge and compound semiconductors), extrinsic semiconductors, Fermi-level in semiconductor, diffusion and carrier life time, Hall effect.

Semiconductor p-n Junction: p-n junction in equilibrium, current-voltage characteristics, charge-control description of a diode, Transition and diffusion capacitance's, diode switching times, diode models, small-signal model and load line concept, and introduction to heterojunctions and double heterojunctions. Diode Circuit Applications: Rectifiers, zener

diodes voltage regulators, clipping circuits, clamping circuits and wave form generation.

Other Types of Semiconductor Diodes: Varactor diode, tunnel diode, photodiode and photovoltaic (solar) cell, Light emitting diode, metal electronic. Transistors Principle of Operation and type, Application Circuit.

EE 108 Basics of Electrical Engineering (3/-/1)

Basic Concept & Units: Electricity & atomic structure of substance, current and current density, current flow, electric circuit, E.M.F. & potential difference, international system of unit, abbreviation for multiples & sub-multiples, quantities derived from SI units, units of force-energy-torque and power, relation between energy and heat, electric units, efficiency & percentage efficiency, electromechanical equivalent of element. Analysis of D.C Circuit: Ohm's law, resistivity & conductivity, temperature affect, internal resistance of a source, open circuit & short circuit, equivalent resistance: Series-parallel-circulating current method-floating source method & grouping of E.M.F. sources, double subscript, power calculation in D.C circuit, introduction to network theorems, types of source: independent and dependent voltage and current sources and their transformation, Kirchhoff's laws: KVL-KCL, Maxwell's circulating currents (mesh analysis), nodal analysis, superposition theorem, thevenin's theorem, Norton's theorem, maximum power transfer theorem, millman theorem, substitution theorem, reciprocity theorem. Alternating Quantities: Magnetic fields, magnetic fields due to electric current, magnetic fields in a coil, force in current carrying conductor across a magnetic fields, left hand rule, magnitude of the force, electromagnetic induction, faraday's law, right hand rule, magnitude of induce e, m, f., magnitude of e. m. f. in a coil, generating of single phase voltage, waveforms-instantaneous value and real

EE 110 Arabic Language (1/-/-)

Advantages and important of Arabic languages, the rules of writing "Al-Hamzah". Parsing and its types and cases. Verbs and their divisions: The past verb, the present verb, imperative verb. Subject. Object. The way of founding words in Arabic Dictionaries. Applied study includes: a) Verses from holy Quran, b) A poem from Arabic poetry. The rule of writing the number. Subject and predicted. Punctuation marks. Applied study includes: a) Versus from holy Quran, b) A prose.

**College of Engineering / Electric Engg. Dept. / Second Class
Electronics & Communications**

Course No.	Subject	First Term			Second Term			Unit No.
		Theo	Pract	App.	Theo	Pract	App.	
EEC 201	Management & Industrial Safety	2	-	-	2	-	-	4
EEC 202	Mathematics II	3	-	1	3	-	1	6
EEC 203	Computer Programming	2	2	-	2	2	-	6
EEC 204	Electromagnetic Fields	2	-	1	2	-	1	4
EEC 205	Electronics I	2	-	1	2	-	1	4
EEC 206	Communications Principles	3	-	1	3	-	1	6
EEC 207	Power & Machines	2	-	1	2	-	1	4
EEC 208	Elective Subjects (Electrical Networks)	2	-	1	2	-	1	4
EEC 209	Electronics & Communications Lab.	-	3	-	-	3	-	4
Total		18	5	6	18	5	6	40
		29			29			

EEC 201 Management & Industrial Safety (2/-/-)

Management essentials (concept, objectives, principles, efficiency, effectiveness, Engineering efficiency, types of projects & companies, decision making, Maintenance (concept, objectives, classes, alternative between preventive & corrective maintenances, application and case study, lubrication and it's methods). Estimating of spare part & manpower for maintenance Fault (Concept, classes, causes, standard for machines, efficiency, tools for monitoring machine operation), Reliability for machine (concept, measurement, applications), Replacement (Concept, causes, classes, applications).

Essential for industrial safety (Concepts, objectives, work accidents & injuries), Environment work dangerous, (Classes, engineering protection methods), Static Electrical Dangerous (Its Sources in Work Place &

Protective Ways), Continuous electrical dangerous (Sources & causes in work place, preventive general rules for electrical and mechanical-tools safety, checking, earthing, personal productive tools for working up electrical places, generators, nets, changeover, engineering, causes for facing continuous electrical dangerous), Electrical injuries (its determinations, electrical shocking, preventive method from high voltage shocking, method for saving injuries by electrical power, General preventive methods for decreasing accidents & injuries in projects (Human activities: Training, protective education), (Technical activities: Engineering design, maintenance safety guard-fixed & interlocking, personal protective equipments).

EEC 202 Mathematics II (3/-/1)

Ordinary Differentiation Equations: Second order (Homogeneous and non-homogeneous), Higher order differential equations: Matrices, system of linear equations (gauss elimination), rank of a matrix, eigen values and eigen vectors, multiple integrals, double integral, areas and volumes, double integral in polar coordinates, evaluation of volume and triple integral, evaluation of surface and surface integrals. Finding the centroid of a region. Fourier series, periodic functions. Fourier series-Euler formulas, even and odd functions (half-range) expansions, applications in electrical eng., Fourier transform, properties, applications in electrical eng., Laplace transform, unit step function, Gamma function, definition of L.T., properties. Inverse Laplace transform, properties, partial fractions, solution of differential equation using Laplace transform, Laplace transform applications (orthogonal trajectories and electric circuit). Vectors, equations of lines and planes, product of three or more vectors, vector function & motion: Velocity and acceleration, tangential vectors, curvature and normal vector. Partial Differentiation, function of two or more variables, partial derivatives, directional derivative, gradient, divergence and curl, tangent plane and normal line, maxima, minima and saddle point. Sequence and series, sequence convergence, test of monotone, series geometric series, nth partial sum, test of convergence, alternating series, power and Taylor's series.

EEC 203 Computer Programming (2/-/1)

Introduction to MATLAB., Types of variables, numbers. Expressions, operation and function. Matrix and its applications. Solving set of linear equations. Control flow in MATLAB program. Curve fitting, interpolation. Function and its application (pulse & ramp functions). Numerical application (numeric differentiation and numerical integration. Engineering graphics (two dimension and multi-dimensions) such as vector diagram mesh, bar plots). Solving equation by symbols. Introduction to SIMULINK and its libra. Application in electrical and electronic circuits. Introduction to graphical user interface. Introduction to lab view. Multimedia system definition, multimedia work station components, distributed multimedia systems architecture, media classification and applications. Multimedia audio system, audio digitizing and sampling, digital audio, audio editing equipment. Image file formats, image and color models, color image acquisition, color image display. Analog video, digital video, video broadcasting standards, video storage standards.

EEP 204 Electromagnetic Fields (2/-/1)

Review of Vector Analysis; Coulomb's Law and Electric Field Intensity; Electric Flux Density and Gauss's Law; Energy and Potential; Conductors, Dielectrics and Capacitance; Poisson's and Laplace's Equations; Steady Magnetic Field; Biot-Savart's Law; Ampere's Law; Magnetic Flux Density and Magnetic Flux; Inductance; Magnetic Forces and Materials; Time-Varying Field; Faraday's Law: Induced Electromotive Force; Maxwell's Equations; Wave Equations; Wave Propagation in Different Media; Poynting Vector.

EEC 205 Electronics I (2/-/1)

Bipolar Junction Transistors (BJTs): Basic transistor operation, volt-ampere equation for the BJT, region of operation, graphical analysis of BJT, regions of operation stability & compensation graphical analysis of BJT as an amplifier, small-signal models, analysis of CE, and CB configurations, BJT as a switch, current sources using BJTs, Field Effect Transistors: Junction field-effect transistor (JFET): physical operation and static characteristics. Metal-Oxide semiconductor FET (MOSFET): depletion-type MOSFET, enhancement-type MOSFET. DC analysis of FET, the FET as an amplifier, graphical (load line) analysis, small-signal FET models, analysis of CS, CD and CG configurations, using FETs as switch, voltage variable resistor, and constant current source, Multistage

Amplifiers: Analysis of multistage amplifiers (voltage gain, current gain, ect...), types of multistage amplifiers (cascode,...ect), Tuned Amplifiers: Transformer-coupled amplifiers, single-tuned amplifiers, tapped and double-tuned amplifiers, Introduction to four-layer devices: Description and operation of silicon controlled rectifier, diac, thyristor, GTO, and triac.

EEC 206 Communication Principles (3/-/1)

Transmission Line: Transmission Line Equation, Steady State Response. Graphical Solution of Transmission Line. Smith Chart, Stub matching. Signals and System: Representation of Periodic Signals (Fourier Series). Representation of Non Periodic Signals (Fourier Transform). Linear Time Invariant System, Frequency Response, Impulse Response, Spectral Density Function. Convolution, Transmission without Distortion. Modulation: Amplitude Modulation, Demodulation Super heterodyne Receiver. Angle Modulation, PM and FM Modulations. FM Discriminators, FM Receiver. Noise: Representation of Noise, Noise Figure. Signal to Noise ratio in AM, FM System.

EEC 207 Power and Machines (2/-/1)

Generation Stations: Types, Equipment, Source of primary energy. **Transmission Lines:** Types, comparison among them, Equivalent Circuit Line Resistance, Inductance and Capacitance, Charging current. **D.C Machines:** Construction, principle of operation, E.M.F Equation, Commutation, Losses, Torque & power, speed control, efficiency. **Transformers:** Construction, electromagnetic induction, equivalent circuit, Losses & their separation, open & short circuit tests, efficiency, Three phase transformers, other types of Power transformers. **3-phase induction machines:** torque-speed characteristics, principle of operation, Equivalent Circuit, speed control. **Single-phase induction machines:** Starting methods, capacitors used. **Synchronous machines:** Construction and operation, equivalent circuit and vector diagram. **Special machines.** **Power Electronics:** Power semiconductor devices, Characteristics, Triggering and commutation, Controlled rectifiers, Single phase AC Controllers, Harmonics and Power Factor.

EEC 208 Elective Subject (Electric Networks) (2/-/1)

The Transient Circuits: RC, RL, RLC circuit in series and parallel and their complete response in time and Frequency. Polyphase Circuits: Single-phase three wire system, Circle diagram, 3-Phase balance and unbalance system star and delta connections, Power in 3-phase circuits. Coupling: Magnetic coupling, Coefficient of coupling, equivalent circuits Linear and ideal transformers. Two-Port Networks: One-port networks, y-z-h-g and ABCD parameters, Image and Iterative operations, Attenuation and phase functions, and insertion loss of networks. Filters: Constant k-filters, Low pass and high pass modern filter design, Butterworth and chebyshev filters, Network transformations, and all pass filter, Active filter.

College of Engineering / Electric Engg. Dept. / Second Class Power & Machines

Course No.	Subject	First Term			Second Term			Unit No.
		Theo	Pract	App.	Theo	Pract	App.	
EEP 201	Management & Industrial Safety	2	-	-	2	-	-	4
EEP 202	Mathematics II	3	-	1	3	-	1	6
EEP 203	Computer Programming	2	2	-	2	2	-	6
EEP 204	Electronics I	2	-	1	2	-	1	4
EEP 205	Electric Networks	2	-	1	2	-	1	4
EEP 206	Electrical Machines	2	-	1	2	-	1	6
EEP 207	Electromagnetic Fields	2	-	1	2	-	1	4
EEP 208	Laboratories	-	3	-	-	3	-	2
EEP 209	Elective Subjects (Distribution Systems)	2	-	-	2	-	-	4
Total		18	5	5	18	5	5	40
		28			28			

EEP 201 Management & Industrial Safety (2/-/-)

Management essentials (concept, objectives, principles, efficiency, effectiveness, Engineering efficiency, types of projects & companies, decision making, Maintenance (concept, objectives, classes, alternative between preventive & corrective maintenances, application and case study, lubrication and it's methods). Estimating of spare part & manpower for maintenance Fault (Concept, classes, causes, standard for machines, efficiency, tools for monitoring machine operation), Reliability for machine (concept, measurement, applications), Replacement (Concept, causes, classes, applications).

Essential for industrial safety (Concepts, objectives, work accidents & injuries), Environment work dangerous, (Classes, engineering protection methods), Static Electrical Dangerous (Its Sources in Work Place & Protective Ways), Continuous electrical dangerous (Sources & causes in work place, preventive general rules for electrical and mechanical-tools safety, checking, earthing, personal productive tools for working up electrical places, generators, nets, changeover, engineering, causes for facing continuous electrical dangerous), Electrical injuries (its determinations, electrical shocking, preventive method from high voltage shocking, method for saving injuries by electrical power, General preventive methods for decreasing accidents & injuries in projects (Human activities: Training, protective education), (Technical activities: Engineering design, maintenance safety guard-fixed & interlocking, personal protective equipments).

EEP 202 Mathematics II (3/-/1)

Ordinary Differentiation Equations: Second order (Homogeneous and non-homogeneous), Higher order differential equations: Matrices, system of linear equations (gauss elimination), rank of a matrix, eigen values and eigen vectors, multiple integrals, double integral, areas and volumes, double integral in polar coordinates, evaluation of volume and triple integral, evaluation of surface and surface integrals. Finding the centroid of a region. Fourier series, periodic functions. Fourier series-Euler formulas, even and odd functions (half-range) expansions, applications in electrical eng., Fourier transform, properties, applications in electrical eng., Laplace transform, unit step function, Gamma function, definition of L.T., properties. Inverse Laplace transform, properties, partial fractions, solution of differential equation using Laplace transform, Laplace transform applications (orthogonal trajectories and electric circuit). Vectors, equations of lines and planes, product of three or more

vectors, vector function & motion: Velocity and acceleration, tangential vectors, curvature and normal vector. Partial Differentiation, function of two or more variables, partial derivatives, directional derivative, gradient, divergence and curl, tangent plane and normal line, maxima, minima and saddle point. Sequence and series, sequence convergence, test of monotone, series geometric series, nth partial sum, test of convergence, alternating series, power and Taylor's series.

EEP 203 Computer Programming (2/2/-)

Introduction to MATLAB., Types of variables, numbers. Expressions, operation and function. Matrix and its applications. Solving set of linear equations. Control flow in MATLAB program. Curve fitting, interpolation. Function and its application (pulse & ramp functions). Numerical application (numeric differentiation and numerical integration. Engineering graphics (two dimension and multi-dimensions) such as vector diagram mesh, bar plots). Solving equation by symbols. Introduction to SIMULINK and its libra. Application in electrical and electronic circuits. Introduction to graphical user interface. Introduction to lab view. Multimedia system definition, multimedia work station components, distributed multimedia systems architecture, media classification and applications. Multimedia audio system, audio digitizing and sampling, digital audio, audio editing equipment. Image file formats, image and color models, color image acquisition, color image display. Analog video, digital video, video broadcasting standards, video storage standards.

EEP 204 Electronics I (2/-/1)

Bipolar Junction Transistors (BJTs): Basic transistor operation, volt-ampere equation for the BJT, region of operation, graphical analysis of BJT, regions of operation stability & compensation graphical analysis of BJT as an amplifier, small-signal models, analysis of CE, and CB configurations, BJT as a switch, current sources using BJTs, Field Effect Transistors: Junction field-effect transistor (JFET): physical operation and static characteristics. Metal-Oxide semiconductor FET (MOSFET): depletion-type MOSFET, enhancement-type MOSFET. DC analysis of FET, the FET as an amplifier, graphical (load line) analysis, small-signal FET models, analysis of CS, CD and CG configurations, using FETs as switch, voltage variable resistor, and constant current source, Multistage Amplifiers: Analysis of multistage amplifiers (voltage gain, current gain, ect...), types of multistage amplifiers (cascode,...ect), Tuned Amplifiers: Transformer-coupled amplifiers, single-tuned amplifiers, tapped and double-tuned amplifiers, Introduction to four-layer devices: Description

and operation of silicon controlled rectifier, diac, thyristor, GTO, and triac.

EEP 205 Electric Networks (2/-/1)

The Transient Circuits: RC, RL, RLC circuit in series and parallel and their complete response in time and Frequency. Polyphase Circuits: Single-phase three wire system, Circle diagram, 3-Phase balance and unbalance system star and delta connections, Power in 3-phase circuits. Coupling: Magnetic coupling, Coefficient of coupling, equivalent circuits Linear and ideal transformers. Two-Port Networks: One-port networks, y-z-h-g and ABCD parameters, Image and Iterative operations, Attenuation and phase functions, and insertion loss of networks. Filters: Constant k-filters, Low pass and high pass modern filter design, Butterworth and chebyshev filters, Network transformations, and all pass filter, Active filter.

EEP 206 Electrical Machines I (3/-/1)

Principles of Electro-Mechanical Energy Conversion. Classification of Electrical Machines. D.C generators, general principle, construction and working E.M.F equations. Armature winding. Armature Reaction and Commutation. Types of Generation, Losses in Generators, the Efficiency, Generator Characteristics. Parallel Operation of D.C Generators. D.C Motors: Motor Principle, Voltage Equation of Motor, Torque, Types of Motors, Motor Characteristics, Power Stages. Losses and Efficiency. Speed Control of D.C Motors, Braking, and Starters, testing of D.C Machines. Transformers, working Principle of Transformers, transformer Construction, E.M.F equation. Transformer on No Load and on Load. Transformer Equivalent Circuit, open and Short Circuit Test, Separation of Core Losses, Regulation of Transformer. Losses & Efficiency. All-Day Efficiency, Auto-Transformer, Parallel Operation. Three-Phase Transformer, Connections, Open-Delta, Scott Connection.

EEP 207 Electromagnetic Fields (2/-/1)

Review of Vector Analysis; Coulomb's Law and Electric Field Intensity; Electric Flux Density and Gauss's Law; Energy and Potential; Conductors, Dielectrics and Capacitance; Poisson's and Laplace's Equations; Steady Magnetic Field; Biot-Savart's Law; Ampere's Law; Magnetic Flux Density and Magnetic Flux; Inductance; Magnetic Forces and Materials; Time-Varying Field; Faraday's Law: Induced

Electromotive Force; Maxwell's Equations; Wave Equations; Wave Propagation in Different Media; Poynting Vector.

EEP 209 Elective Subject (Distribution Systems) (2/-/-)

Distribution Networks: Introduction, Classification of Distribution System, Methods of Connection, Comparison among Distribution Systems.

Type of D.C Distributions:

- D.C Distributor fed at One End-Concentrated Loading.
- D.C Distributor fed at Both End- Concentrated Loading.
- D.C Distributor fed at One End with Uniformly Distributed Load.
- D.C Distributor fed at Both Ends with Uniformly Distributor Load.

D.C Ring Distributor: Ring Distributor with Inter-Connector, Stepped Distributor, 3 wire D.C System.

A.C Distributors, Single-phase and three-phase distributor.

Capacitor Application: Capacitor Construction and Standard Rating, Connections, Power Factor Improving, Voltage and Sizing for Optimal Line Loss Reduction, Capacitor Switching.

Distribution System Overcorrect Protection: Fuses, Fuse Grading, Recloses, Sectionalizes, Time-delay over Current Relays, Circuit Breakers, Protection of Distribution Lines, Protection of Distribution Transformers and Distribution Capacitors, Overload, Overload Grading.

**Collage of Engineering / Electrical Engg. Dept. / Third Class
Power & Machines**

Course No.	Subject	First Term			Second Term			Units No.
		Theo	Pract	App	Theo	Pract	App.	
EEP 301	Statistics & Engineering Economics	2	-	-	2	-	-	4
EEP 302	Engineering Analysis	2	-	1	2	-	1	4
EEP 303	Power Electronics	3	-	1	3	-	1	6
EEP 304	Electrical Machines	2	-	1	2	-	1	4
EEP 305	Electrical Powers	2	-	1	2	-	1	4
EEP 306	Measurements	2	-	1	2	-	1	4
EEP 307	Electronic and Communication System	2	-	1	2	-	1	4
EEP 308	Elective Subjects. (Microprocessor and Interfacing Systems)	2	-	-	2	-	-	4
EEP 309	Power & Machines Lab.	-	6	-	-	6	-	4
Total		17	6	6	17	6	6	38
		29			29			

EEP 301 Statistics of Engineering Economy (2/-/-)

* **Engineering Economy:** (Definition of Economics, Engineering Economy, The Basic Objective of Engineering Economic Study, Engineering Economy and Decision between Alternative, The Economic Environment : Consumer & Producer of Goods and Services, Necessities, Luxuries Goods and Services, Competition, Monopoly, The Total-Relationship, The Law of Supply and Demand, The Law of Diminishing Returns, Unit-Cost Function, Breakeven Point Charts Analysis, Production Planning by Linear Programming: The Concept of Linear Programming (L.P.), Methods of L.P., Applications, Critical Path Economy: The Gantt Charts, Critical Path Method (CPM), Projection Evaluate and Review Technique (PERT), Applications.

* **Statistics:** 1. Probability theory, cumulative distribution function 2. Probability density function (p.d.f) (uniform distribution, Gaussian distribution, exponential distribution ...etc).

Random variables, mean value, expected value, mean square, variances, covariance. Theory of random process (stationary and non stationary, e.g. Ergodic process) Reliability theory.

EEP 302 Engineering Analysis (2/-/1)

Z-Transform: Definition, region of convergence, properties, inverse Z-Transform, partial fraction, long division, contour integration, transfer function, difference equations. Series Solution of Differential Equations: Frobenius method, Bessel differential equation, first kind, second kind, properties, modified Bessel differential equation. Partial Differential Equations: One dimensional wave equation separation of variables, telephone equation, Laplace equation. Function of Complex Variables: definitions, complex differentiation, complex functions, complex integration, analytic function. Numerical Analysis: Solution of non-linear equations, numerical differentiation and integration.

EEP 303 Power Electronics (3/-/1)

Power switching devices families (Diodes, thyristors, power transistors, TRIAC, GTO, LASCR, Darlington power transistor, Bipolar junction transistors MOSFETS, IGBT); Theory of operations, types, characteristics, applications. Important performance parameters for non-sinusoidal voltage and/or current waveforms: Fourier Series, effective RMS, real power, reactive power, apparent power, distortion power, effective power factor, total Harmonic distortion, efficiency, distortion factor, ripple frequency, ripple factor, spectrum analysis, which will be applied for the

following converters. A.C to D.C Convertors (rectifiers), single and three-phase controlled and uncontrolled converters driving resistive, inductive, and highly inductive loads. AC to AC voltage controllers, single phase and three phase controller for both resistive and inductive loads. D.C to A.C single-phase and three-phase bridge Convertors (inverters). Pulse width modulation (PWM) strategies. D.C to D.C Convertors (DC Choppers): Step up, step down converters, buck, boost, buck-boost, and Cuk regulators. Thyristor commutation circuits. Important applications such as: Dc an AC switch mode power supply, Dual converters, cycloconverter. DC and AC electrical machines drives, STATCOM, active filter. Uninterruptible power supply. Induction furnace, protection circuit and sunbber circuits.

EEP 304 Electrical Machines (2/-/1)

Introducing to rotating electrical machines and their classifications, rotating MMF theorem, equivalent circuit of three-phase induction machines, Construction & Characteristics of 3-phase induction motors, power and torques in three-phase induction machines, open and blocked rotor tests, torque-speed Characteristics, circle diagram, NEMA design classes of Induction Motors rotors, starting methods of three-phase induction motors, breaking methods of three-phase induction motors, speed control methods of three-phase induction motors, induction generators, introducing to Synchronous Machines and their constructions, Equivalent Circuit, power and torques in synchronous machines, phasor diagram, Voltage Regulation, open and short circuit tests, operating Synchronous generator alone (P-F and Q-V Characteristics), conditions and advantages of parallel operation of S.G, parallel of S.G with infinite bus, synchronous motors, starting of synchronous motors, V-curves, speed control of synchronous motors, synchronous compensators.

EEP 305 Electrical Power Engineering (2/-/1)

Supply Systems, substation, choice of transmission voltage, Supporting Structures. Over Head Transmission Lines (OHTL), Electrical Design of OHTL, Mechanical Design of OHTL, Corona, Insulators. Representation of OHTL, General Circuit Constant, Power Circle Diagram, Electric Power cables, Earthling Systems, Connection of 3-Phase Transformers, Normal operation of the system.

EEP 306 Measurements (2/-/1)

Units, System of Units, Measurements and Error, DC Indicating Instruments, AC Indicating Instruments, Measurements of Power Quantities, DC Bridges, AC Bridges, Oscilloscopes, Transducers, Electronic Instruments for Measuring Voltage and Currents, Electronic Instruments for Measuring Basic Parameters, Introduction to Instrumentation, Signal recorder instruments.

EEP 307 Electronic and Communication System (2/-/1)

Amplifier Frequency Response (Input and Output), Power Amplifier (Class A, B, and C), Negative Feedback (The Effect of the –Ve Feedback on Amplifier Operation), Operation Amplifier and Its Application, Wave Generation and Analog Computer, D.C. Power Supply and Regulation, Transmission Line Principles Signals and Systems, Amplitude and Frequency Modulation, Noise Communication System Performance.

EEP 308 Elective Subjects (Microprocessor and Interfacing Systems) (2/-/-)

Introduction to Intel Microprocessor families, 8088 / 8086 Microprocessor architecture, Memory Segments, Addressing modes, Assembly language instructions, Debug program, Using the MASAM assembler, Bus architecture, Buffers-latches-Decoders, Interfacing between memories and Input / Output devices, Peripheral programming interfacing (PPI) 8255A, Programmable internal timer unit (PIT) 8254, Direct memory access (DMA) 8237A, Interrupts (ports, universal serial BUS USB), Application.

**Collage of Engineering / Electrical Engg. Dept. / Third Class
Electronics & Communications**

Course No.	Subject	First Term			Second Term			Units No.
		Theo	Pract	App.	Theo	Pract	App.	
EEC 301	Statistics & Engineering Economics	2	-	-	2	-	-	4
EEC 302	Engineering Analysis	2	-	1	2	-	1	4
EEC 303	Radiation & Propagation	2	-	1	2	-	1	4
EEC 304	Digital Communications	3	-	1	3	-	1	6
EEC 305	Electronics II	2	-	1	2	-	1	4
EEC 306	Digital Electronics	2	-	1	2	-	1	4
EEC 307	Computer Engineering	2	-	1	2	-	1	4
EEC 308	Elective Subjects (Measurements)	2	-	1	2	-	1	4
EEC 309	Electronics & Communications Lab.	-	6	-	-	6	-	4
Total		17	6	7	17	6	7	38
		30			30			

EEC 301 Statistics of Engineering Economy (2/-/-)

* **Engineering Economy:** (Definition of Economics, Engineering Economy, The Basic Objective of Engineering Economic Study, Engineering Economy and Decision between Alternative , The Economic Environment : Consumer & Producer of Goods and Services, Necessities, Luxuries Goods and Services, Competition, Monopoly, The Total-Relationship, The Law of Supply and Demand, The Law of Diminishing Returns, Unit-Cost Function, Breakeven Point Charts Analysis, Production Planning by Linear Programming: The Concept of Linear Programming (L.P.), Methods of L.P., Applications , Critical Path Economy: The Gantt Charts, Critical Path Method (CPM), Projection Evaluate and Review Technique (PERT), Applications.

* **Statistics:** 1. Probability theory, cumulative distribution function
2. Probability density function (p.d.f) (uniform distribution, Gaussian distribution, exponential distribution ...etc).

Random variables, mean value, expected value, mean square, variances, covariance. Theory of random process (stationary and non stationary, e.g. Ergodic process) Reliability theory.

EEC 302 Engineering Analysis (2/-/1)

Z-Transform: Definition, region of convergence, properties, inverse Z-Transform, partial fraction, long division, contour integration, transfer function, difference equations. Series Solution of Differential Equations: Frobenius method, Bessel differential equation, first kind, second kind, properties, modified Bessel differential equation. Partial Differential Equations: One dimensional wave equation separation of variables, telephone equation, Laplace equation. Function of Complex Variables: definitions, complex differentiation, complex functions, complex integration, analytic function. Numerical Analysis: Solution of non-linear equations, numerical differentiation and integration.

EEC 303 Radiation & Propagation (2/-/1)

Radiation Principle: Radiation Pattern, Gain, Impedance, Polarization, Simple Radiation Systems: Short Dipole, Monopole, Small Loop, Linear Antennas, Resonance Antennas, Broadband Antennas, Dish Antennas, Antenna Array, Propagation Principles, Fading, Polarization, Reflection, Refraction, Diffraction, Free-Space Propagation, Ionospheric Propagation, Ground Wave Propagation, Troposphere Propagation, Microwave passive devices, Microwave active devices.

EEC 304 Digital Communications (3/-/1)

Probability, Random Variably and Processes, Correlation Function and Power Spectral Density Pulse Modulation, PAM, PWM, and PPM, Pulse Code Modulation, Delta Adaptive Delta Modulation, Information Theory, Channel Capacity, Probability Error in Channels, Coding, Hamming Code, CRC Code, Digital Modulation Techniques, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Differential PSK, Qudrature PSK, TV engineering, Spread spectrum.

EEC 305 Electronics II (2/-/1)

Frequency Response of Multistage Amplifiers, Differential Amplifier, Differential Amplifier Applications, Power Amplifier Class (A), Power Amplifier Class (B, AB), Power Amplifier Class (C). Power Amplifier Class (D). Power Amplifier Class (E & F). Negative Amplifier Circuit. Positive Amplifier Circuit. Oscillator (Radio Frequency), Application of Small Signal Generator, Frequency Synthesizer and PLL. Power Supply Circuit. Types of Voltage regulator Power Supply Circuit.

EEC 306 Digital Electronics (2/-/1)

Latches, Gated S-R latch, Gated D latch, Edge-triggered Flips Flops. Pulse triggered (Master-slave) Flip Flops. Synchronous and asynchronous counters, cascaded counters, counter decoding, glitches in asynchronous counter decoding. Shift registers, bidirectional shift registers, shift register counters. Memories, RAM, ROM, PROM, memory expansion. PLA and PAL circuits. D/A conversions: R-2R, A/D conversion: Successive approximation stair step ramp. Sequential synchronous logic circuit design: Mealy and Moors model, state diagram, state table, implication chart. Sequential asynchronous logic circuit design. Digital integrated circuit technologies, MOSFET inverter and BJT inverter, basic operational characteristics, CMOS digital circuits, TTL circuits, practical considerations in the use of TTL and CMOS.

EEC 307 Computer Engineering (2/-/1)

Introduction to Intel microprocessors, their specification and history. Bus types: Data bus, address bus, control lines. Types of memories: Main memory, auxiliary memory, ROM, RAM. 8086/8088 Microprocessor internal architecture: The software model of 8086/8088, general purpose

registers, pointer register, segment registers, flags register, bus interface unit, execution unit. Assembly language: Syntax of instructions in assembly language: Machine encoding. Instruction Set I: Data transfer instructions arithmetic instructions, logic instructions, shift and rotate instructions. Instruction Set II: Program flow control instructions, flags control instructions, string instructions. Memory system in 8086/8088: Segmentation. Introduction to advanced microprocessors: 80286, 80386. Protected mode, multitasking, privilege levels.

EEC 308 Elective Subjects (Measurements) (2/-/1)

Units, System of Units, Measurements and Error, DC Indicating Instruments, AC Indicating Instruments, DC & AC Bridges, Oscilloscopes, Transducers, Electronic Instruments for Measuring Voltage and Current, Electronic Instruments for Measuring Basic Parameters, Digital Measuring Instruments, Introduction to Instrumentation, Signal Recorder Instruments, Signal Generators.

**Collage of Engineering / Electrical Engg. Dept. / Fourth Class
Power & Machines**

Course No.	Subject	First Term			Second Term			Units No.
		Theo	Pract	App.	Theo	Pract	App.	
EEP 401	Power System Analysis	2	-	2	2	-	2	4
EEP402	Protection & Operation of PS	2	-	1	2	-	1	4
EEP 403	Advanced Electrical Machines	3	-	1	3	-	1	6
EEP 404	High Voltage Systems	2	-	-	2	-	-	4
EEP 405	Final Year Project	1	3	-	1	3	-	4
EEP 406	Power & Machines Lab.	-	6	-	-	6	-	4
EEP 407	Control Engineering	3	-	1	3	-	1	6
EEP 408	(Generation Systems) Elective Subjects	2	-	-	2	-	-	4
Total		15	9	5	15	9	5	36
		29			29			

EEP 401 Power System Analysis (2/-/2)

Single Line Diagram Simulation, Mathematical Simulation of P.S, Load Flow Analysis Using Computer, Short Circuit Study, Symmetrical Short-Circuit, Symmetrical Component, Unsymmetrical Fault, Short Circuit Analysis Using Computer, Economical Operation of Power System, Voltage and Frequency Control, Stability Analysis, Steady State Stability, Transient Analysis Stability, Solving of Using Equations in Power System Using Computer.

EEP 402 Protection & Operation of PS (2/-/1)

Transducers (current transformers, Voltage transformers), Circuit breakers, Types of relays and its operation principles, over current relays, directional over current relays, Differential protection, Protection of bus bar, Transformers protection, Generators protection, Motors protection, Distance protection, Distance protection in computer using MATLAB-SIMULINK.

EEP 403 Advanced Electrical Machines (3/-/1)

Single phase synchronous motors: Variable reluctance type motors, hysteresis motor. Single phase induction motors: Motors with main winding only, unbalanced operation of unsymmetrical two phase motor, single phase motors with main and auxiliary windings. Linear induction machines: Types and characteristics and applications. Stepper motors: Types, construction, characteristics and applications. Switched reluctance motors. Single phase AC series commutator motor. The universal motor. The repulsion motor. Three phase ac commutator machines. The rotating frequency changer. AC shunt commutator motor. A.C. Drives. Static frequency changers.

EEP 404 High Voltage Systems (2/-/-)

Electrical Insulators, Gasses, Liquids and Solids, Generation of High Voltages, Alternating, Dissect and Impulses, Measurements of High Voltage, High Voltage Tests, Over Voltages, Lightning & Switching Operation Surges Sources, Earthling, Operation Earthling, Safety Earthling, Insulation Coordinating, High Voltage Apparatus.

EEP 407 Control Engineering (3/-/1)

Open and Closed Loop Control Systems, Massun Gain Formula, State Variables, State Equations, State Diagram, Decomposition of transfer function & State Equation, Controllability and Observe ability of Control System, State Feed Design^(*), Mathematical_Modeling of Control System, Time Domain Response of Linear Control System^(*), Stability of Linear Control System, Rowth Hurwitz Method, Root Locus^(*), Design of Controller Using Root Locus Technique^(*), Nyquist Criterion, Frequency Response Analysis of Control System, Bode Diagram, Nichols Chart^(*), Design of Control System Using Frequency Response Method. Lag, Lead Compensatory^(*), Introduction to digital control system. Introduction to non linear system.

^(*) Computer Application Using MATLAB Program.

EEP 408 Elective Subjects (Generation Systems) (2/-/-)

Energy Sources, Type of Electrical plants: [Thermal Power plants, Hydro-Power plants, Gaseons Power plants, (Gas Turbines), Diesel Power plants, Nuclear Power plants], Major Electrical Equipment in Power plants, combined operation of different power plants, governors prime-movers, new generation systems, Economics of Generation, optimum Economics dispatch of Power System, transmission system effects of optimum Economics dispatch of Power System.

**Collage of Engineering / Electrical Engg. Dept. / Fourth Class
Electronics & Communications**

Course No.	Subject	First Term			Second Term			Units No.
		Theo	Pract	App.	Theo	Pract	App.	
EEC 401	Engineering Project	1	3	-	1	3	-	4
EEC 402	Engineering Control	3	-	1	3	-	1	6
EEC 403	Communication Engineering	3	-	-	3	-	-	6
EEC 404	Digital Signal Processing (DSP)	2	-	1	2	-	1	4
EEC 405	Microelectronic	2	-	1	2	-	1	4
EEC 406	Computer Networks	2	-	1	2	-	1	4
EEC 407	Elective Subjects (Computer interfacing systems)	2	-	-	2	-	-	4
EEC 408	Laboratories	-	6	-	-	6	-	4
Total		15	9	4	15	9	4	36
		28			28			

EEC 402 Engineering Control (3/-/1)

Open and Closed Loop Control Systems, Massun Gain Formula, State Variables, State Equations, State Diagram, Decomposition of transfer function & State Equation, Controllability and Observe ability of Control System, State Feed Design^(*), Mathematical_Modeling of Control System, Time Domain Response of Linear Control System^(*), Stability of Linear Control System, Rowth Hurwitz Method, Root Locus^(*), Design of Controller Using Root Locus Technique^(*), Nyquist Criterion, Frequency Response Analysis of Control System, Bode Diagram, Nichols Chart^(*), Design of Control System Using Frequency

Response Method. Lag, Lead Compensatory^(*), Introduction to digital control system. Introduction to non linear system.

^(*) Computer Application Using MATLAB Program.

EEC 403 Communication Engineering (3/-/-)

Satellite Communication, geosynchronous orbit satellite, frequency bands used, earth segment, channel, space segment. Uplink and down signal budget calculations, multiple access techniques, centralized and decentralized control. SPADE system. Mobile radio propagation, large scale path loss, small scale fading and multipath. The cellular concept, frequency reuse, channel assignment strategies, handoff, interference and system capacity, improving coverage and capacity in cellular systems. Wireless System and standards (AMPS, ETACS, GSM). Spread spectrum (frequency hopping direct sequence). CDMA cellular system. Mobile Satellite System LEO, MEO, HEO, satellite system for low data rate and high data rate communication satellite (Iridium, Teledesic, ...). Global positioning system (GPS).

EEC 404 Digital Signal Processing (DSP) (2/-/1)

Review of Continuous-Time Signals and Sampling Theory, Discrete-Time Signals and Systems, Difference Equation(D.E) Representation, Time-Domain Representations and Impulse Response $h(n)$, Convolution and De-convolution, Frequency-Domain Representations and Frequency Response $H(e^{j\omega})$, Z-Transform, Properties, Applications on Signal and Systems, Inverse Z-Transform and Applications, Analogue Filter Design, IIR Digital Filter Design, FIR Digital Filter Design, IIR Filter Structures:(Direct Form I, Direct Form II, Direct Form II Transpose, Cascade Structure, Parallel Form Structure, Poly-Phase and Lattice Structures), FIR Filter Structures:(Direct, Poly-Phase and Lattice Structure), Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) Algorithms, Development of the FFT Algorithms with Radix-2, Decimation-in-Time and Decimation-in-Frequency FFT Algorithms with Radix-2, Development of the FFT algorithms with Radix-4.

EEC 405 Microelectronic (2/-/1)

Energy band theory (Insulator, conductor, semiconductor), Pn junction, MS (Metal-semiconductor) junction MOS (Metal-oxide-semiconductor) junction, electronic devices fabrication technology, IC fabrication steps, TTL, DRL, RTL, DTL, ECL, IL, NMOS and CMOS digital circuits, NMOS inverter analysis, CMOS inverter analysis, NMOS digital circuit analysis, CMOS digital circuit analysis TTL digital circuit analysis, ECL digital circuit analysis DTL digital circuit analysis, Fan-out in digital circuits, noise margin in digital circuits, microwave devices tunnel diode, IMPATT diode, BARITT diode, pseudo NMOS logic circuits, transferred electron device, photo detectors, solar Cells. Laser diode, LED diodes, Fiber characteristics, Material and fabrication, Fiber losses, Chromatic dissipation, Polarization mode dispersion, Fiber nonlinearities, Nonlinear Refraction, Stimulated inelastic scattering, Importance of nonlinear effects.

EEC 406 Computer Networks (2/-/1)

Introduction. Protocol and layering models (ISO/OSI and TCP/IP). Physical layer (cabling, signaling ... etc.). Data link layer (HDLC Protocol, Error detection). Mathematical Modeling of some protocols (Aloha, slotted Aloha ...). Network layer, (Routing Algorithms and IP Addresses). Transport layer (TCP, UDP, SCTP ...). Application layer, (Security principles, hash function ...). Wireless networks (ad-hoc and Infrastructure made ...). Local area network, (Ethernet, token ring ...). High speed LANs (Fast Ethernet, FDDI, 1 G bit Ethernet ...). Client/server architectures. Introduction to Internet Protocols. Internet applications.

EEC 407 Elective Subject (Computer interfacing systems) (2/-/1)

An Introduction to Computer Family, An Introduction to INTEL, Microprocessor Family, XT Bus, Memory (Read/Write) Cycles, Input-Output Cycles, Direct memory Access System (DMA), Interrupt Mode, Programmable Interval Timer 8253, Programmable Peripheral Interface 8255, Address Decoding, Analog To Digital Converters A/D, Digital To Analog Converters D/A, Parallel printer Port, Serial Port RS 232, An Expansion of the XT Bus By ATBUS, 16 Bit Data Transfer by Using DMA and by ATBUS, GPIB BUS, PCI BUS, Display Adapter Cards, General Application of her Computer Interfacing, Microcontroller (architecture, programming), Application of Microcontroller.

