**COURSES DESCRIPTION FOR**

**Department of Electronic Engineering**

**College of Engineering**

**University of Diyala**

**Diyala, Iraq**

**Second Year**

***Prepared by Department Academic Staff***

***Reviewed, revised and introduced by:***

***The Scientific Committee of the Department***

**Second Year**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***First Semester*** | | | | | ***Second Semester*** | | | | |
| ***Course Title*** | ***Credit***  ***Hours*** | ***Weekly hours*** | | | ***Course Title*** | ***Credit Hours*** | ***Weekly hours*** | | |
| ***Lec.*** | ***Tut.*** | ***Lab.*** | ***Lec.*** | ***Tut.*** | ***Lab.*** |
| ***Advance Mathematics –I*** | ***3*** | ***3*** | ***1*** | ***-*** | ***Advance Mathematics- II*** | ***3*** | ***3*** | ***1*** | **-** |
| ***Electronics I*** | ***3*** | ***2*** | ***1*** | ***2*** | ***Electronics II*** | ***3*** | ***2*** | ***1*** | ***2*** |
| ***Electric Circuits Analysis I*** | ***2*** | ***2*** | ***1*** | ***-*** | ***Electric Circuits Analysis II*** | ***2*** | ***2*** | ***1*** | ***-*** |
| ***Advanced Programming*** | ***2*** | ***1*** | ***1*** | ***2*** | ***Measurement &Instruments*** | ***2*** | ***2*** | ***-*** | ***-*** |
| ***Electro-Magnetics I*** | ***2*** | ***2*** | ***1*** | ***-*** | ***Electro-Magnetics II*** | ***2*** | ***2*** | ***1*** | ***-*** |
| ***Digital Electronic I*** | ***3*** | ***2*** | ***1*** | ***2*** | ***Digital Electronic II*** | ***3*** | ***2*** | ***1*** | ***2*** |
| ***Machines (DC)*** | ***3*** | ***2*** | ***1*** | ***2*** | ***Power and AC Machines*** | ***4*** | ***3*** | ***1*** | ***2*** |
|  |  |  |  |  | ***Entertainment & Culture Activity*** | ***-*** | ***-*** | ***-*** | ***1*** |
| ***Total*** | ***18*** | ***14*** | ***7*** | ***8*** | ***Total*** | ***19*** | ***16*** | ***6*** | ***7*** |
| ***29*** | | | ***29*** | | |

**Course Number: E201**

**Course Name: Advance Mathematics I**

**Credit hours: (3-3-1-0)**

**Pre-requisite: None**

**Partial Differentiation:** 1- Function of two or more variables 2- Partial derivatives 3- Directional derivative. 4- Gradient, divergence and curl. 5- Tangent plane and normal line. 6- Maxima, minima & saddle point.  **Ordinary Differential Equations**) First order (variable separable, homogeneous, linear-Bernoulli and exact).ii) Second order (Homogeneous and nonhomogeneous).iii) Higher order differential equation. **Laplace Transform(L.T. ) :**A) 1- Unit step function 2- Gamma function 3- Definition of L.T. 4- Properties. B) Inverse Laplace Transform. 1- Properties. 2- Partial fractions. 3- Solution of differential equations using Laplace turns form .C) Applications (orthogonal trajectories and electric circuit). **Vectors cont.**1- Equations of line and planes 2- Product of three or more vectors 3- Vectors function & motion, velocity and acceleration 4- Tangential vectors 5- Curvature and normal vector.

**Course Number: E202**

**Course Name: Advance Mathematics II**

**Credit hours: (3-3-1-0)**

**Pre-requisite: Advance Mathematics I**

**Sequences and series**

i) Sequences :convergence ,test of monotone ii)- Series : geometric series , nth partial sum , test of convergence , alternating series. iii) Power and Taylor's series.  **Fourier Series:**1-Periodic functions 2- Fourier series – Euler formulas 3- Even and odd functions (Half – Range expansion) 4- Applications in electrical engineering. **Multiple Integrals :**1-Double integral 2-Areas and volumes 3-Double integral in polar coordinates 4-Evaluation of volume and triple 5-Evaluation of surface &surface integral. **Matrices cont:**1-System of liner equations (gauss elimination) 2- Rank of matrix 3- Eigen values Eigen vectors .

**Course Number:EE201**

**Course Name: Electronic I**

**Credit Hours: (3-2-1-2)**

**Pre-requisite: None**

**Diode Circuit Applications: Rectification**, Clipping, Clamping, Voltage Multipliers, Diode Switching Circuits, Zener Diode Characteristics and Applications. **Bipolar Transistor Circuits :** Construction, Operation, Configurations and Characteristics, Operating Regions, Load–Lines, The Transistor as an Amplifier, DC Biasing Circuits and Stability, Power Dissipation, Switching Transistors.  **BJT Small-Signal Analysis :**Transistor Equivalent Circuits, Voltage and Current Gain, Input and Output Impedance, analysis of CE, CB and CC configurations.

**Course Number:EE202**

**Course Name: Electronic II**

**Credit Hours: (3-2-1-2)**

**Pre-requisite: Electronic I**

**FET Transistor and Circuits:** Construction and Characteristics of JFET, MOSFET Construction and Characteristics, CMOS, DC Biasing Circuits. **FET Small-Signal Analysis:** Amplifier JFET / MOSFET, Small Signal Model Analysis, analysis of CS, CG and CD configurations.  **Multistage Amplifiers:** Analysis of Multistage Amplifiers (voltage gain, current gain, ect…), types of multistage amplifier, Cascade and cascode amplifier's, Darlington amplifier.  **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.

**Course Number: EE203**

**Course Name: Electric Circuits Analysis I**

**Credit Hours: (2-2-1-0)**

**Pre-requisite: None**

1- Three – Phase Networks:

Three phases voltage source, phase sequences, line and phase quantities, balanced and

unbalanced systems, analysis of YY, YD, DY, DD connected circuits for balanced and

unbalanced systems, power calculations and measurements in three phase circuit

2- Two – Port Networks:

Definitions and terminologies, analysis of two port parameters sets (z, y, h, g, ABCD, and

abcd), relationships between parameters, interconnection of networks

3- Magnetically Coupled Circuits:

The concept of self and mutual inductances, analysis of magnetically coupled circuits, polarity

and the dot convection rules, energy in magnetically coupled circuits, coupling coefficient,

linear transformers, ideal transformer, ideal auto-transformer, conductively coupled equivalent

circuits

4- Frequency Response:

Transfer function, the decibel scale, bode plot, locus diagrams of simple series and parallel

circuit.

**Three – Phase Networks:** Three phases voltage source, phase sequences, line and phase quantities, balanced and unbalanced systems, analysis of YY, YD, DY, DD connected circuits for balanced and unbalanced systems, power calculations and measurements in three phase circuit. **Two – Port Networks:** Definitions and terminologies, analysis of two port parameters sets (z, y, h, g, ABCD, and abcd), relationships between parameters, interconnection of networks. **Magnetically Coupled Circuits:** The concept of self and mutual inductances, analysis of magnetically coupled circuits, polarity and the dot convection rules, energy in magnetically coupled circuits, coupling coefficient, linear transformers, ideal transformer, ideal auto-transformer, conductively coupled equivalent circuits. **Frequency Response:** Transfer function, the decibel scale, bode plot, locus diagrams of simple series and parallel circuit.

**Course Number: EE204**

**Course Name: Electric Circuits Analysis II**

**Credit Hours: (2-2-1-0)**

**Pre-requisite: Electric Circuits Analysis I**

**Electric Filters**  Types of electrical filters, analysis of simple passive filters, low – pass, high – pass, band –pass and band-stop filters, scaling. **Non – Sinusoidal Waves** The Fourier series, Fourier coefficients, analysis of circuits with non – sinusoidal waves, illustrative applications, active power calculations with periodic functions, rms value of periodic function. **Electric Transients (Classical Method)** Analysis of RL, RC and RLC transient in dc and ac circuits.  **Electric Transients (Laplace Method)** Applications of laplace transform in transient analysis, circuits elements in the S- domain, laplace equivalent circuits.

**Course Number: EE205**

**Course Name: Advance Programming**

**Credit hours: (2-1-1-2)**

**Pre-requisite: None**

**Programming by MATLAB**A: brief history / importance of MATLAB, Simple program of MATLAB, Variable, numbers, operations, functions, plots in matlab , plots of points, axes label, graph title, drawing multi point in the same graph, Basic program control (for) statement, nesting loop, (if) statement, (if …..else) statement, Arrays, 1-D arrays initialization, 2D- arrays, matrix operations in matlab. introduction to similink tools, Application of Matlab in Electrical circuit.

==============================================================

**Course Number: EE206**

**Course Name: MACHINES (DC)**

**Credit hours: (3-2-1-2)**

**Pre-requisite: None**

**DC MACHINES,** Basic concepts, construction, winding. **DC Generators,** Principle of operation, construction, types of dc generators, emf equation, total loss and efficiency, armature reaction, commutation problems and their minimization, Characteristics, parallel operation, applications. **DC Motors,** Principle of operation, construction, types, torque equation, characteristics, losses and efficiency, starting speed control, applications.

**Course Number: EE207**

**Course Name: Power and AC MACHINES**

**Credit hours: (4-3-1-2)**

**Pre-requisite: None**

**Electrical Power:** ( Power definition, Power in 1-cct, Power in 3-cct, Power plant over head transmission line, Conductor material, Material design sag tension relationship) **Single Phase Transformer,** Principle of working, construction, equations, types, equivalent circuits, losses and efficiency. **Single Phase Induction Motors,** types, principle of operation, characteristics, applications. **Stepper Motors,** types, principle of operation, characteristics, applications. **Universal Motors,** types, principle of operation, characteristics, applications. **Brushless Motors,** types, principle of operation, characteristics, applications. **Synchronous Motors,** types, principle of operation, characteristics, applications.

**Course Number: EE208**

**Course Name: Electro-Magnetics I**

**Credit hours: (2-2-1-0)**

**Pre-requisite: Fundamentals’ of Elect. Eng. II, Mathematics II**

**Course Contents:** Vector analysis: scalars and vectors, vector algebra, the Cartesian coordinate system, vector component and unit vector, the vector field, the dot product, the cross product, circular cylindrical coordinate system, spherical coordinate system, the transformation between coordinate system, differential elements (volume, surface, and line), Coulomb's law and electric field intensity: the experimental law of Coulomb, electric field intensity, field of n point charges, electric fields due to continuous charge distributions (line charge, surface charge and volume charge distributions), steam line and sketches of fields, Electric flux density, Gauss's law-electric flux density, gauss's law, some symmetrical charge distribution, application of gauss's law; divergence, Maxwell's first equation (for electrostatics), the vector operator and the divergence theorem, Energy and potential-energy expended in moving a point charge in an electric field, the line integrals, potential difference and potential, the potential field of a point charge, the potential field of a system of charges, conservative property, potential gradient, the dipole energy density in the electrostatic field, conductors, Dielectrics and capacitance-current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions, the method of mages, semiconductors, the nature of dielectric materials, boundary conditions for perfect dielectric materials, capacitance, capacitance of some useful configuration, capacitance of a two wire line, Poisson's and Laplace's equations-Poisson's and Laplace equations, uniqueness theorem, solution of Laplace’s equation in certain situation, solution of Poisson's equation in certain situation, product solution of Laplace’s equation.

======================================================

**Course Number: EE209**

**Course Name: Electro-Magnetics II**

**Credit hours: (2-2-1-0)**

**Pre-requisite: Electro-Magnetics I**

**Course Contents:** The steady of magnetic field, biot- savart law, the curl, stocke's theorem, ampere's circuit law, application of ampere's law, magnetic flux and magnetic flux density, the scalar and vector magnetic potential, derivation of steady magnetic field laws, Magnetic forces, materials and inductance-force on a moving charge, force on a differential current element, force between differential current elements, force and torque on a closed circuit, the nature of magnetic materials, magnetization and permeability, magnetic boundary conditions, the magnetic circuit, potential energy and forces on magnetic materials, inductance and mutual inductance, time varying fields and Maxwell's equations-faraday's law, displacement current, Maxwell’s equations in point form, Maxwell’s equations integral form, the retarded potentials.

**==============================================================**

**Course Number: EE210**

**Course Name: Digital Electronic I**

**Credit Hours: (3-2-1-2)**

**Pre-requisite: Digital** **Technique I, Digital Technique II**

**Synchronous Sequential Logic:** (Review of: Latch, R-S, D, J-K and T Flip-flop), Master / Slave JK Flip Flop), **Monostable** multivibrator (one-shot), 555 A stable Multivibrator. **Registers:** Shift Register, Serial In /Serial out, Serial In /Parallel out, Parallel In /Serial out and Parallel In/ Parallel out Shift Register, Register with Parallel Load, **Johnson Counter, Ring Counter,** Shift Register Application. **Counters:** Asynchronous (Ripple) Counters**,** BCD Ripple Counter**,** Synchronous Counters, Design of Synchronous Counter, Counter Applications.

**====================================================================**

**Course Number: EE211**

**Course Name: Digital ElectronicII**

**Credit Hours: (3-2-1-2)**

**Pre-requisite: None**

**Memory and Storage**: Memory Address and Capacity, Basic Memory Operations, The Write and Read Operation, **RAMs and ROMs,** RAM Family. **Digital-to-Analog Converter Methods, Analog-to-Digital Converters Methods, Programmable logic Device**: introduction and classification of: SPLDs, CPLDs, and FPGA**, Integrated Circuit Technologies,** Diode RTL, CMOS and TTL Logic gates.

**Course Number: EE212**

**Course Name: Measurement and Instruments**

**Credit hours: (2-2-0-0)**

**Pre-requisite: None**

**Course Contents:** Systems of Units and Standards of Measurement, Systems of units, International system of units, electrical standard, time and frequency standards, IEEE standards. Measurement and Error: Definitions, accuracy, precision, resolution, composition of measuring system, selection factors and trends, types of error: gross, systematic, random, and limiting errors. Statistical Analysis of Data, Instruments for Measuring Basic Electrical Parameters, Bridges and their Applications, Oscilloscopes, Transducers: Position, pressure, velocity, acceleration, force, torque, temperature, Photosensitive transducers. Data Recording Instruments, Noise: Limits to sensitivity, accuracy & speed in both analog and digital systems. S/N enhancement techniques, Computer-based Instrumentation and Measurement

======================================================

**Course Number: EE213**

**Name: University Culture Activity**

**Credit hours: (0-0-0-1)**

**Pre-requisite: None**

**Course Contents:** These courses are designed to give the student the required skills in human development such as preparing engineering report, presentation to a large gathering of people, team cooperation, preparing and participation of some university activities, and everything that might be needed in successful and modern life style. Culture Connect: Experience the cultures of the world (samples), To expose students to the life ways of a diversity of cultures around the world. To help students understand that all people need the same basic things and use what they have available in their environment to obtain those things. To teach students to respect cultural differences.