**COURSES DESCRIPTION FOR**

**Department of Electronic Engineering**

**College of Engineering**

**University of Diyala**

**Diyala, Iraq**

**Third Year**

***Prepared by Department Academic Staff***

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

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

**Third Year**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***First Semester*** | | | | | ***Second Semester*** | | | | |
| ***Course Title*** | ***Credit***  ***Hours*** | ***Weekly hours*** | | | ***Course Title*** | ***Credit Hours*** | ***Weekly hours*** | | |
| ***Lec.*** | ***Tut.*** | ***Lab.*** | ***Lec.*** | ***Tut.*** | ***Lab.*** |
| ***Digital Signal Processing I*** | ***2*** | ***2*** | ***1*** | ***-*** | ***Digital Signal Processing II*** | ***2*** | ***2*** | ***1*** | ***-*** |
| ***Advanced Electronics I*** | ***3*** | ***2*** | ***1*** | ***2*** | ***Advanced Electronics II*** | ***3*** | ***2*** | ***1*** | ***2*** |
| ***Communication Systems I*** | ***3*** | ***2*** | ***1*** | ***2*** | ***Communication Systems II*** | ***3*** | ***2*** | ***1*** | ***2*** |
| ***Microprocessor and Microcontroller: Hardware*** | ***3*** | ***2*** | ***1*** | ***2*** | ***Microprocessor-Based System: Programming*** | ***3*** | ***2*** | ***1*** | ***2*** |
| ***Engineering Analysis I*** | ***2*** | ***2*** | ***1*** | ***-*** | ***Engineering Analysis II*** | ***2*** | ***2*** | ***1*** | ***-*** |
| ***Antenna*** | ***3*** | ***2*** | ***1*** | ***2*** | ***Engineering Administration*** | ***2*** | ***2*** | ***1*** | ***-*** |
| ***Elective I*** | ***2*** | ***2*** | ***1*** | ***-*** | ***Elective II*** | ***2*** | ***2*** | ***1*** | ***-*** |
| ***Total*** | ***18*** | ***14*** | ***7*** | ***8*** | ***Total*** | ***17*** | ***14*** | ***7*** | ***6*** |
| ***29*** | | | ***27*** | | |

**Course Number: EE301**

**Course Name: Digital Signal Processing I**

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

**Pre-requisite: None**

**Introduction** :*basic elements of digital signal processing systems, advantage of digital over analog signal processing, and continuous versus discrete time signals*. **The concept of frequency in continues time and discrete time signals**: *analog to digital and digital to analog conversion, sampling of continuous time signals, sampling theorem , and aliasing and signal reconstruction*. **Digital signals and systems:** *common digital sequences, generation of digital signals, classification of digital sequences, some manipulation of discrete time signal (shifting, scaling, and multiplication of sequences).* **Discrete time Systems:** *Input – output system representation, classification of discrete time systems(Linearity versus nonlinearity, causality versus non-causality, time variance versus time invariance, static versus dynamic, and stable versus unstable systems*. **Block diagram representation of discrete time systems:** *an adder constant multiplier, a signal multiplier, a unit delay element, a unit advance element, and interconnection of discrete time systems*. **Discrete time systems as difference equation:** *difference equation and impulse responses, format of difference equation.* **Linear convolution and signal comparison**: *method of linear convolution of discrete time sequences, signal comparison (correlation).***Circular convolution of discrete time sequence. Numerical Computation of Fourier Transform:** *discrete Fourier transform (DFT), Invers of Discrete Fourier transform (IDFT), application of Discrete Fourier Transform, fast Fourier transform (FFT), inverse of Fast Fourier transform (IFFT).*

**Course Number: EE302**

**Course Name: Digital Signal Processing II**

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

**Pre-requisite: Digital Signal Processing I**

**Discrete time system analysis using Z-transform:** *Z-transform of linear time systems, direct Z-transform, region of convergence of Z-transform, properties of Z-transform, rational Z-transform (the z-Plane Pole-Zero Plot and Stability poles), inverse of Z-transform.* **Digital Filters:** *Basic Types of Filtering ( Finite impulse response (FIR )) , (Infinite impulse response (IIR) digital filter techniques) .***Realization of Digital Filters**: *realization of digital FIR filters (Direct form structure) , realization of digital IIR filters (Direct form I realization), (Direct form II realization).* ***Analog Filter design:*** *(Butterworth filter design (LPF, HPF, BPF, and BSF)), (Chebyshev filter design (LPF, HPF, BPF, and BSF)).***Digital filter design :**(**Finite Impulse Response Filter Design**): *Fourier Transform Design, applications (Noise Reduction), design of FIR filters using windows. Infinite Impulse Response Filter Design: bilinear Transformation Design Method, analog to digital filter transformation*. **Application of digital filters. Introduction to adaptive filtering. Application of adaptive filtering.**

**Course Number:EE303**

**Course Name: Communication System I**

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

**Pre-requisite: *none***

**Communication system elements (Signal analysis):**Signal classification of periodic and non periodic signals, classification of systems**,** power spectral Density and correlation  **Noise:** Power calculation, thermal white Gaussian noise (AWGN), band-limited noise (base band and band pass) noise through linear systems. **Liner modulation (AM):** An AM\DSB-SC,AM/DSB-LC,AM/SSB-SC,AM/VSB, frequency division multiplexing (FDM)Commercial receivers (TRF and super heterodyne), and noise in AM systems.

**Course Number:EE304**

**Course Name: Communication System II**

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

**Pre-requisite: Communication System I**

**Angle modulation :** NBFM, NBPM, WBPM ,WBPM**,** Noise in angle modulation systems. **Digital communications:** Nyquist sampling theorem, pulse modulation : PAM, PPM, Time division multiplexing (TDM), noise in pulse modulation, pulse code modulation PCM\TDM**,** Delta modulation (DM), quantization noise in PCM and DM. Signaling format (unipolar, bipolar, &split-phase Manchester),Sinusoidal digital modulation ASK, PSK, FSK , and Mary. Noise in ASK, PSK, FSK (error probability using coherent matched filters and no coherent detection)**.**

**Course Number: EE305**

**Course Name: Microprocessor and Microcontroller: Hardware**

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

**Pre-requisite: None**

**Introduction to Microprocessor and Single-chip Microcontroller. Microprocessor Architecture and Microcontroller Systems, General definitions, Internal Architecture of Microprocessor. (**BIU, EU**)** (pin Diagram, Memory ( program, data and stack memory), Registers ( Accumulator, Flage (Sign,Zero, Cary..), General Registres, Stack pointer, program counter), Addressing mode (direct add., register add., register indirect add., Immediate add). **address space and data organization, Segment registers and memory segmentation,** Input output Devices, Review: Logic devices for interfacing**. Memory Interface,** Memeory segment. **Interfaceing I/O Devices,** Basic interfacing concepts, interface output displays, interface input devices, memory mapped I/O. **Programmable** Interface Devices: 8155 I/O and Timer, 8279 Keyboard/Display Interface. **General Propose Programmable** Interface Peripheral Devices**, 8255A, 8253 Programmable** Interface Timer, 8259A **Programmable** Interrupt Controller, Direct Memory Access and 8237 DMA Controller.Introduction to 8051 microcontroller; Pin diagram, architecture, features & operation, Ports, memory organization, SFR’s, Flags, Counters/Timers, Serial ports.

**Course Number: EE306**

**Course Name: Microprocessor-Based System: Programming**

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

**Pre-requisite: Microprocessor-Based System: Hardware and Interface**

**Introduction to Assembly Language, Data transfer operation**, Arithmetic Operation, Logic Operation, Branch Operations, **Writing Assembly Language Program**. Programming Techniques with Additional Instructions, Looping, Counting, and Indexing.**Additional Data Transfer and 16-bits Arithmetic Instructions**, Arithmetic Operation related to memory, **Logic Operation**: Rotate, Compare. Counters and Time Delays. Stack and subroutines, conditional and unconditional Calling and Returning.

**Course Number:EE307**

**Course Name: Engineering Analysis I**

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

**Pre-requisite: None**

**Matrix Analysis:** Review of matrix theory , linear transformation , Egin values &Egin vectors, laplace transform of matrices, application of matrices to electric cct. **Fourier Series:** Fourier series, Fourier integral, Electrical circuits applications using Fourier series. **Fourier transform:** Properties, convolution theorem, power spectral density and correlation, signals and linear system, applications. **The Z- transform:** Region of convergence, properties of Z-transform, Z-transform pairs, the inverse of Z-transform, analysis and discrete- time systems, applications. **Numerical Analysis:** i) Solution of non-linear equations (Iteration, bisection and Newton – Raphson). ii) Finite differences. iii) Numerical differentiation and Integration. iv) Numerical Solution of 1st order ordinary differential equations.

**Course Number: EE308**

**Course Name: Engineering Analysis II**

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

**Pre-requisite: None**

**Complex Variable Theory:** Function of complex variable, complex differentiation, analytic function & its properties, integration in the complex plane, Cauchy's theorem, Cauchy's integral, Taylor's theorem, Laurent series, the residue theorem. **Solution of differential equations, by power series:** Legendre's equations, Legendre’s polynomials, Bessel function of the first and second order kinds, Bessel function properties. **Partial differential equation:** Wave equation, Laplace's equation, solution of boundary condition problems, general solution, solution by separation of variables. **Statistics:** Definition, frequency distribution (relative & commutative, mean, standard deviation). **Probability:** Definition, mutually exclusive & conditional probability, permutations & combinations, probability distribution, normal & Poisson distributions.

**Course Number: EE309**

**Course Name: Advance Electronic I**

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

**Pre-requisite: Electronic I, Electronic II**

**Analog Electronic Circuit Analysis(Review);** Transistor equivalent circuit, voltage gain, current gain, ZilpandZolpfor Lf& Hf. **Frequency Response Characteristics;** Frequency small signal models of: JFETs&BJTs, frequency response of various amplifier configurations. **Millers Theorems & Its dual;** dividing, shunt impedance, series impedance, input and output impedances terminal, analysis of transistor circuit using simplified h- parameter. **Amplifier Frequency Response;** Frequency response concepts, transistor at high frequency, multi stage at low & high frequency, FETs &BJTs amplifiers at low &high frequency. **Feedback Amplifier;** Feedback concept, types, effects & topologies, feedback analysis, voltages series, voltage shunt, current series and current shunt, feedback stability & response of feedback amplifier

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**Course Number: EE310**

**Course Name: Advance Electronic II**

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

**Pre-requisite: Advance Electronic I**

**Operational Amplifier Design;** Op-Amp characteristics and structure, difference amplifier :(dc& ac analysis), dc level shifting stage. **Operational Amplifier Applications**; Inverting and non-inverting Amplifiers, Integrator, Differentiator, Adder, Subtract, Comparator, Precision diode, Rectifier, Precision clamps, Sample and hold circuit, and peak detector. **Oscillator: Oscillator** concept, RC oscillator, LC oscillator, Crystal oscillators. **Power Amplifier:** Class A, Class B, Class AB, Push-pull amplifiers & Class C. **Active Filters:** Filters concept, types, approximations, Active RC design, Ladder design, and GIC. **Integrated and fabrication circuit design:** An introduction for fabrication and integrated circuit design, such as for BJT, FET, IC categories.

**Course Number: EE311**

**Course Name: Antenna**

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

**Pre-requisite: None**

**Isotropic antenna and point radiator with reflector and radiation pattern**: Analysis radiative field of the hertizian dipole and its pattern of electric field and power density Short antenna, Gain, Directivity and beam width, Antenna and its pattern of field and radiation resistance and polarization. **Practical Antenna** The loop antenna and its field Radiation, resistance and pattern receiving antenna and effective area of antenna, Antenna above ground and monopole Pattern, Folded antenna, Point radiator arrays and multi antenna arrays and their gain, pattern sstacked antenna, Yagi antenna, Slot antenna. **Microwave antenna** Horn and parabola, Microwave losses, Helical antenna and helix antenna.

**Course Number: EE312**

**Course Name: Engineering Administration**

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

**Pre-requisite: None**

**Administration:** Definition, management tools, and management duties, scientific management, administration and other sciences, marketing, marketing activities, product through buying, selling, advertising, transportation, warehouses, goods, finance and risk. **Production**: Factors of production, markets, types of production, revenue, costs of production. **Plant site selection and planning of the factory. Industrial Performance,** Theoretical foundations to assess the industrial performance, functionality and industrial facility, the concept of evaluation of performance efficiency, types of performance assessment, foundations and stages of evaluating the efficiency of performance, indicators of industrial performance evaluation.  **Quality Control:** The concept of quality control, integrated control of the quality and functions of quality control costs for quality control, testing methods, quality control schemes, types of quality control schemes. **Work Study.** Important, the study of the performance mode, the areas of application performance study, the application stages, to be provided during the application in the reserves, steps study methods of performance, measurement of work, study time, General requirements for the use of measurement methods for work, human engineering.**Feasibility study for engineering projects, Maintenance and replacement.**