



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



ELICTRICAL ENGINEERING DEPARTMENT

M.Sc. Electrical Engineering
Electrical Engineering Diploma



M. Sc. Electrical Engineering

Symbol	Subject	No. of Units	Note
EEE 640	Engineering Analysis	2	
EEP 670	Modeling and Simulation	2	
EEE 638	English Language	2	
EEE 653	Microelectronics	2	Elective
EEE 644	Antennas and Wave Propagation	2	Elective
EEE 661	Computer Networks	2	Elective
EEP 667	Power Electronics	2	Elective
EEP 683	Power System Analysis	2	Elective
EEP 669	Advanced Machines	2	Elective
EEE 647	Modern Control Theory	2	
EEE 680	Programmable Controllers	2	
EEE 690	Scientific Research Methods	-	
EEP 682	Power System Protection	2	Elective
EEP 671	Advanced High Voltage	2	Elective
EEP 672	Electrical Drives	2	Elective
EEE 652	Digital Signal Processing	2	Elective
EEE 648	Microwave Devices	2	Elective
EEE 646	Mobile Communication	2	Elective

(EEE640) Engineering Analysis:

Optimization: nonlinear programming, linear programming. Discrete Mathematics: matrix, Solution of differential equations, types of D.E. Z-transform, discrete and fast Fourier transform matrices techniques, optimal conditions partial differential equations.

(EEP 670) Modeling and Simulation:

Introduction, simulation techniques, modeling concepts, computer techniques for modeling and simulation. Modeling and simulation of intelligent systems: - Intelligent system: Definitions and examples. Modeling of biological neural node and network. - Simulation of artificial neural networks using matlab software. - Continuous-time system (CTS) and discrete-time system (DTS):- Modeling of DTS. - Simulation of DTS using matlab software. PID modeling and Simulation, Make a simple model using SiEvents simulator, simpowersystem-demo- power electronics models- Speed Control of a DC Motor Using BJT H-Bridge, Help-simpowersystem-demo- power electronics models- AC-DC-AC PWM Converter, Make a simple model using NS3 simulator, Make a simple model using ADS simulator, Make a simple model using SiMetrix simulator.

(EEE 638)English Language:

The syllables for the M.Sc. course in English covers the following activities:

- 1- Reading, silent and loud, which requires trainers the students to comprehend what they read, in addition to . attention to their oral performance in terms of pronunciation and intonation which together express what is being read. This may be achieved through reading scientific and engineering text, and dealing with the language aspect, in then.

- 2- Training the students to write in English taking into consideration the . language structures with all their details.
- 3- Training the students to correctly use English structures and grammar topics such as verb . prepositions, types of sentences (statement / question /negative and simple/complex/compound).
- 4- Training the student, listen attentively in order to understand what their professors say and . write down the important points ..
- 5- Training the students in the general principles of translation which my.

(EEE653) Microelectronics:

- 1- Biasing in MOS amplifiers circuits.
- 2- Basic configurations of single stage IC MOS amplifiers.
- 3- The MOSFET as an analog switch.
- 4- The MOSFET unity-gain frequency (F_u).
- 5- Small signal operation of the BJT differential amplifier.
- 6- The non-ideal characteristics of the differential amplifiers.
- 7- Biasing in BJT integrated circuits.
- 8- The BJT differential amplifier with active load.
- 9- The MOS differential amplifiers.
- 10- BICMOS amplifiers.
- 11- Sense amplifiers and address decoders.

(EEE644) Antennas and Wave Propagation:

Basic characteristic of antennas, Linear wire antennas, Ground effects on Radiation from linear antennas, loop antennas, Arrays (linear, planar), Broadband antennas, Aperture antennas (Microstrip antennas, Horns), Principles of propagation (Ground wave propagation, Troposphere wave propagation and Ionosphere wave propagation).

(EEE661) Computer Networks:

A brief history of the internet , Protocol layers and their service model. Application Layer : the web and HTTP, FTP, SMTP, DNS. Transport Layer: connection less protocols connection oriented protocols, congestion control. Network Layer: virtual circuit networks , Router Design, Internet Protocol , Routing algorithms. Link Layer and Local area networks: Multiple Access protocols, Link layer addressing. Switches and Hubs: Bridges, Transport, learning, minimal spanning, tree algorithm.

(EEP667) Power Electronic:

Switching regulators. D.C. → D.C converters. Switched mode power supplies phase controlled converters. HVDC transmission system voltage source converters. Pulse width modulation strategies. Applications of power electronics on power systems.

(EEP683) Power System Analysis:

Matrix formulation, load flow study, short circuit analysis, economic operation of power system, stability of power system application in computer. Matrix formulation, load flow study, short-circuit study, steady state and transient stability, optimum planning and economic operation of electric systems. V/Q operation and control, f/p operation and control, flexible AC transmission systems operation and control, power quality principle and monitoring, reliability of power system.

(EEP669) Advanced Machines:

Generalized theory of electrical machines, Dynamic of D.C machines Transients & dynamics of induction machines, Transients & dynamics of synchronous machines, time & space in A.C machines, the effects of these harmonics on the machine methods of reducing the harmonic Behavior of A.C machine under variable frequency operation, Brush less excitation system of synchronous machines, two phase control motor, the speedometer & the accelerometer, super conduction machines.

(EEE647) Modern Control Theory:

- 1- Introduction.
- 2- Intelligent control system specifications and properties.
- 3- Neural network based control system design introduction to neural network, back propagation, learning rules.
- 4- Fuzzy control system. Member ship fuzzy set, fuzzification, rule base-defuzzification fuzzy logic, fuzzy controller.
- 5- Genetic algorithm.
- 6- State space representation of CS.

- 7- Solution of state equation, Lyapunov and equations.
- 8- Stability.
- 9- Controllability and observability.
- 10- Control system design: Pole assignment synthesis.
 - Observer design.
 - Optimal control design.

(EEE680) Programmable Controllers

The 80386DX and the 80486DX μ Ps. The 32-bit Family μ Ps. Real-mode: Software Architecture, Instruction Set, Addressing Modes, Memory Management. Protected-mode: Software Architecture, Memory Addressing, Memory Paging Mechanism, Cache Memory, General Hardware Architecture. Introduction to the Pentium TM μ P. Introduction to: P4 with Hyper Threading Technology, Pentium D, Pentium Extreme Edition.

Overview of embedded systems Introduction to Microchip PIC16 microcontroller, architecture and memory organization PIC16 Microcontroller's instruction set Download, install and explanation of microchip MPLAB IDE software. I/O ports, SFR, Timers and counters Analog to Digital convertor Serial communication protocols (UART, I²C, SPI) Introduction to PLC PLC station components Ladder diagram and Ladder Logic Bit logic instructions Timers and counters instructions

Memory Organization, code blocks and data blocks Digital I/O modules: Types, configuration with explanation of some digital sensors and actuators. Analog I/O modules: Types, configuration with explanation of some digital sensors and actuators.

(EEP682) Power System Protection:

Over current directional relays, differential relays, distance protection, factors affecting distance protection ANN application in distance protection, adaption of distance protection, auto-reclosing

(EEP671) Advanced High Voltage:

H.V. insulators, solids, liquids, gasses, P.D. problems, advanced power cables, H.V. D.C transmission systems, control of H.V. D.C., voltages, CEA control, CC control, H.V. D.C power cables.

(EEP672) Electrical Drives:

Principles of adjustable speed drives. Drive system consideration.

D.C. drives, converters for D.C. drives. A.C. drives-induction motor drives-methods of control. Synchronous motor drives-current source inverter. D.C motor characteristic, operating modes, types of single-phase converter drives. Types of single-phase converter drives, types of three-phase converter drives, three-phase dual-converter drives, chopper drives, regenerative brake control closed-loop control of D.C drives.

(EEE652) Digital Signal Processing:

- 1- Review of discrete-time signals and systems, difference equation (D.E) representation.
- 2- Time-domain representation and impulse response $h(n)$.
- 3- Frequency-domain representation and frequency response $H(e^{j\omega})$.
- 4- Z-transform, properties, applications and inverse Z-transform.
- 5- IIR and FIR digital filter designs.

- 6- Digital filter realizations, (IIR filter structures; direct form I, direct form II, direct form II transpose, cascade structure, parallel form structure, Poly-phase and lattice structure).
- 7- FIR filter structures; direct, poly-phase and lattice structures.
- 8- Discrete Fourier transform (DFT) and fast Fourier transform (FFT) algorithms with radix-2 and radix-4.
- 9- Wavelet transform (WT), continuous WT.
- 10- 1-D and 2-D discrete WT, applications.
- 11- DSP chips, TMS32C6x architecture, functional units, pipelining, registers, linear and circular addressing modes, TMS3220C6x instruction set.
- 12- Implementation examples.

(EEE648) Microwave Devices:

Microwave waveguides, S-parameters, N-port networks, Microwave passive devices, Microwave Ferrite devices, Microwave active devices (Linear beam tubes), Microwave active devices (Cross fields tubes), transferred electron devices, Microwave semiconductors diodes, Microstrip lines, Optical fibers.

(EEE646) Mobile Communication:

Classification of mobile communication system, radio phases dispatch system, paging system, ...etc. cellular telephones, the cellular concept, system design fadom, concept of cellular system , cell shape cell patters, frequency reuse, kind of channels in cellular system, cellular telephone system interference, channel assignment fixed , dynamic, and hybrid, multiple access schemes for cellular system FDMA, TDMA, CDMA,

Wireless system and standards, AMPS, GSM, CDMA, UMTS. Mobile satellite system, LTE.

(EEE690) Scientific Research Methods

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EED 520	Advanced Mathematics	2	
EED 506	Programmable Controllers	2	
EED 509	Advanced Electrical Machines	2	Elective
EED 510	Power Electronics	2	Elective
EED 511	Power System Protection	2	Elective
EED 500	Digital Communication	2	Elective
EED 501	Computer Networks	2	Elective
EED 503	Digital Electronics	2	Elective
EED 507	Control Systems	2	
EED 521	Modeling and Simulation	2	
EED 512	Power System Analysis	2	Elective
EED 515	Electrical Drivers	2	Elective
EED 517	Modern Electrical Power Stations	2	Elective
EED 502	Microelectronics	2	Elective
EED 508	Mobile Communication	2	Elective
EED 519	Antennas And Wave Propagation	2	Elective

(EED501) Computer Network:

Introduction to Protocols and Layering, TCP/IP Model, Local area networks (Ethernet, to the ray ...), Application architecture, Introduction to internet.

(EED 502) Microelectronic:

Biasing in MOS Amplifier Circuits, Basic Configurations of Single Stage IC MOS Amplifiers, The MOSFET as an Analog Switch, The MOSFET Unity-Gain Frequency (f_r), Small Signal Operation of the BJT Differential Amplifier, The Non-Ideal Characteristics of the Differential Amplifier, Biasing in BJT Integrated Circuits, The BJT Differential Amplifier with Active Load, The MOS Differential Amplifiers, BICMOS Amplifiers, Sense Amplifiers and Address Decoders.

(EED 503) Digital Electronics:

Review of and comparison between integrated circuit technologies, Design of synchronous and as asynchronous sequential circuit, Programmable Logic Device (PLDs), Complex PLDs (CPLDs), Field-Programmable Gate Array (FPGA), Very High Speed Hardware Description Language VHDL, Memories and Storage: Basic of Semiconductor Memory, ROM Family, ROM, PROM, EPROM, and E2PROM, RAM Family: Static RAM (SRAM), RAM Family: Dynamic RAM (DRAM), Flash Memories.

(EED 500) Digital Communication:

Digital Modulation Technique, Statistical Decision Theory, Scrambling Codes for Cellular Systems, Spread Spectrum, Protocols for Statistical Multiplexing Digital Receivers.

(EED 507) Control Systems:

System representation, System modeling, Time response of higher-order systems, Root Locus and Root contours, Classical design in the S-plane, Classical design in the frequency response, Digital control, State methods for control system design, Robust control systems, Fuzzy logic control systems, Neural network control systems.

(EED 508) Mobile Communications:

Introduction to mobile cellular system, The cellular concept-system design fundamentals, Trunking and grade of service, Cellular system:- AMPs, ETACE, USDS, GSM, Spread spectrum FHSS, DSSS, CDMA system, UMTS.

(EED 506) Programmable Controllers:

Introduction to the 8086-80386 including Pentium processors, Architecture of 80386 microprocessor and interfacing with memory & I/O Real mode of 80386 microprocessor instruction set , assembly programming and debugging. Protected mode of 80386 microprocessor, Registers ,memory management , Virtual mode of 80386 microprocessor , Interrupts and exceptions of 80386 microprocessor.

(EPD 509) Advance electrical machines:

Review of the principle of DC and AC Machines, Steady state and dynamic operation conditions for AC and DC machines (theory and analysis), The effects of non-sinusoidal supply on AC motors, AC Machines Diagnosis, Self excited induction generator ,Theory and analysis of self-excitation - Capacitance requirements - Power conditioning schemes.

(EPD 510) Power electronics:

Types and characteristics of recent Power Semiconductor Devices, P-pulse converters-rectification and inversion operation modes, AC-DC link, Single phase and three phase voltage source inverters- multi step inverters – Current source inverter, PWM strategies, AC voltage controller, Step up and step down cyclo-converters -three phases to single phase and three phases to three phase cyclo-converters, DC To DC Choppers, Switched Mode Power Supply, Drive Applications.

(EPD 511) Power System Protection

Basic philosophy of relaying, Current and potential transformers, Basis of different relays over current and direction relays, Distance protection, factors Affecting distance protection, ANN application in distance protection, adaptation of distance relay, Auto-reclosing , laboratories.

(EPD 512) Power system analysis

Modeling of System Network, Representation of YBUS and ZBUS, Load Flow Study of Power System, Fault Analysis of the Electrical Network, Stability Study, and Application in Computer.

(EED 515) Electrical Machines Drives

Classification of adjustable speed electric drives, Requirements & choice of variable speed drives, Chopper fed DC drives, Controlled rectifiers-fed Dc drives, Stator & rotor side control of AC drives, Voltage source & current source AC drives.

(EED 517) Modern electrical power stations

Energy conversion , renewable energy source , geothermal and power plants , tidal power plants wind power plants , solar power plants , direct energy conversion system , others renewable sources

(EED 520) Advanced Mathematics:

Solution of differential equations, types of D.E. Z-transform, discrete and fast Fourier transform matrices techniques, optimal conditions partial differential equations.

(EEP 521) Modeling and Simulation:

Introduction, simulation techniques, modeling concepts, computer techniques for modeling and simulation. Modeling and simulation of intelligent systems: - Intelligent system: Definitions and examples. Modeling of biological neural node and network. - Simulation of artificial neural networks using matlab software. - Continuous-time system (CTS) and discrete-time system (DTS):- Modeling of DTS. - Simulation of DTS using matlab software. PID modeling and Simulation, Make a simple model using SiEvents simulator, simpowersystem-demo- power electronics models- Speed Control of a DC Motor Using BJT H-Bridge, Help-simpowersystem-demo- power electronics models- AC-DC-AC PWM Converter, Make a simple model using NS3 simulator, Make a simple model using ADS simulator, Make a simple model using SiMetrix simulator.

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