جمهورية العراق

Ministry of Higher Education and Scientific Research

Mayssan University

College of Engineering

Department of Electrical engineering

وزارة التعليم العالي و البحث العلمي

جـــــــــامعة ميســـان

كـــليـــة الهندســـــة

قـــسم الكـــهرباء

المناهج الدراسية ومفرداتها *Curriculum& the unites* لقسم الهندسة الكهربائية *for electrical engineeringdepartment*

وصف المنهج *Course Description*

2018-2017

Course Syllabi

يتكون المنهج في قسم الهندسة الكهربائية من أربع وثلاثين مادة سنوية موزعة على أربعة أعوام وتكون ما مجموعه ١٦٤ وحدة وكما هو موضح من خلال الجداول التالية:-

Current Electrical Engineering Courses

Fourth year

Fourth year

Code	Subject	Hours/Week						Units
		First Term			Second Term			
		Th.	Prac.	Tut.	Th.	Prac.	Tut.	
EEE401	Engineering Project	1	3	-	1	3	-	4
EEE402	Communication (II)	3	-	1	3	-	1	6
EEE403	Power Electronics & Applications	3	-	-	3	-	-	6
EEE404	Electronics	2	-	1	2	-	1	4
EEE405	Power System Analysis	3	-	1	3	-	1	6
EEE406	Control (II)	3	-	1	3	-	1	6
EEE407	Elective Subject¤	2	-	-	2	-	-	4
EEE408	Laboratories	-	6	-	-	6	-	6
Total		**17**	**9**	**4**	**17**	**9**	**4**	**42**

Total hours per week

First term	Second term
٢٨	٢٨

Elective subject: microwave engineering

University of mayssan

College of Engineering – Department of Electrical Engineering

Class: FourthYear

Subject: Communication (II)

Theoretical: 3hr/wk

Tutorial: 1hr/wk

Practical: - hr/wk

EEE 402

1- Information Theory (16 hrs)

Self-information, source entropy and source entropy rate, mutual information, channel model BSC and TSC, joint and conditional entropies, capacity and efficiency of symmetric and non-symmetric discrete channels, optimum threshold setting, capacity of continuous channel (Shannon equation).

2- Coding of Discrete Sources: (12 hrs)

Efficiency and redundancy of code, fixed length codes, variable length codes, Fano code, Huffman code, Shannon code, nonbinary source coding, source extension for higher coding efficiency.

3-Channel Coding: (20 hrs)

Even and odd parity error detecting codes, probability of undetected errors. Error correcting codes, linear block codes (generator and parity check matrices), hamming distance, hamming weight hamming bound, and error correction capabilities.

Decoding of linear block codes (syndromes).

Cyclic codes: Generator polynomial, nonsystematic code (multiplication), systematic cyclic code (division), and realization logic circuit for encoding and decoding of systematic cyclic codes. Convolution codes, encoding logic (generation), tree diagram, static diagram and trellis diagram of convolution code. Decoding of convolution codes using Viterbi algorithm.

4-Introduction to Digital Signal Processing (DSP): (16 hrs)

Block diagram of a general (DSP) system.

Basic concepts: Linear, time variant, stable and casual discrete systems. Input/output relations in Z-domains.

Discrete convolution techniques: Tabular method, Z-transform method, matrix method, odd overlap method.

De-convolution methods: Iterative method and Z-transform method. Frequency response of discrete system. Discrete Fourier transform (DFT), Fast Fourier Transform (FFT) decimation in time.

5-Digital Filter Design: (14 hrs)

Review of analogue filter design (Butterworth and Chebyshev filters). Classification and realization of discrete systems (FIR and IIR systems). IIR filter design using analogue filters and the bilinear transformation, filter transformations for IIR (LPF/LPF, LPF/HPF, LPF/BPF, LPF/BSF).

FIR filter design using windows: Rectangular, Bartlett, hanning, hamming and Blackman windows, LPF, HPF, BPF, and BSF FIR filter.

6- Selected Communication Systems: (12 hrs)

Descriptive lectures on ;

a) **Optical communication systems.**
b) **Satellite communication systems.**
c) **Spread spectrum systems (direct sequence and frequency hopping), PN codes and CDMA.**

1- Timing Circuits: (12 hrs)

Bistable, monostable and astablemultivibrators:

The CMOS monostablemultivibrators. The CMOS astablemultivibrators. Monostablemultivibrators using ECL gates. An integrated circuit TTL monostablemultivibrators. An integrated circuit timer [The 555 timer used as monostable and astablemultivibrators].

2- Logic Circuits and Logic Families: (18 hrs)

3- Analysis and Design of Synchronous Networks: (12 hrs)

4- Digital to Analogue (D/A) and Analogue to Digital (A/D) Converters: (12 hrs)

5- Digital Devices [Memories, ROM, PROM, EPROM, EEPROM, PLA, and RAM]: (15 hrs)

6- Hardware Design of Microcomputers / Microprocessors: (12 hrs)

Microcomputer organization, microprocessor organization, the different types of microprocessors, memory organization, memory address map and memory connection to microprocessors.

7- Design of Digital Instruments with Applications : (9 hrs)

(URDA)/PADC-DAC-8 (Analogue to Digital / Digital to analogue converter, LAB MASTER (Digital in /digital out), Digital in/digital out (programmable parallel port IC-the 8255), (LAB TENDER)

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College of Engineering – Department of Electrical Engineering

Class: Fourth Year

Subject: Control (II)

Theoretical: 3hr/wk

Tutorial: 1hr/wk

Practical: - hr/wk

EEE 406

1- Digital Control System Design: (20 hrs)

Microprocessor control, Shanno's sampling theorem, ideal sampling, the Z-transform, digital control system, stability in the 2-plane, digital compensator design.

2- Optimal and Robust Control System Design: (22 hrs)

Review of optimal control, the linear quadratic regulator, the Kalman filter, robust control, H2 and H∞ optimal control, robust stability and robust performance, multivariable robust control.

3- Intelligent Control System Design: (48 hrs)

(*) Fuzzy logic control system, fuzzy set theory, basic fuzzy set operations, fuzzy relations, fuzzy logic control, self-organizing fuzzy logic control.

(*) Neural network control system, artificial neural networks, learning in neural networks, back-propagation, application of neural networks for modeling, estimation and control.

(*) Genetic algorithms and their applications to control system design, evolutionary design techniques, the genetic algorithm.

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College of Engineering – Department of Electrical Engineering

Class: Fourth Year

Subject: Electrical Power Systems

Theoretical: 3hr/wk

Tutorial: 1hr/wk

Practical: - hr/wk

EEE 405

1-per-Unit Systems: (14 hrs)

Node equations, synchronous machines in power plant.

2- Fault Calculations: (20 hrs)

Symmetrical three-phase faults, symmetrical components (symmetrical components of unsymmetrical phasors, power in terms of symmetrical components, sequence impedance of sequence networks, +ve, -ve, and zero sequence networks, unsymmetrical faults on power systems.

3- Load Flow Solutions: (20 hrs)

Gauss-Seidel method, Newton-Raphson method, data for load flow studies, practical power flow problems utilizing computer algorithms.

4- Power System Stability: (12 hrs)

Stability problem, dynamics of synchronous machines, swing equation, power angle equation, steady state stability, transient stability, equal area criterion, numerical solution of swing equation, multi-machine stability, computer program of transient stability, design methods for improving transient stability.

5- System Protection : (12 hrs)

Switchgear, circuit breakers, quantities required of protection, primary and back-up protection, current transformers, voltage transformers, relays, protection system, over-current protection, over-current and directional, distance protection, unit protection, differential relaying, generator protection, transformer protection, T.L. protection, motor protection.

5- Economic Operation of Power Systems: (12 hrs)

Distribution of load between units within a plant, transmission loss as a function of plant generation, distribution of load between plants, a method of computing penalty factors and loss coefficients, automatic generation control.

University of mayssan

College of Engineering – Department of Electrical Engineering

Class: Fourth Year

Subject: Power Electronics and Machine

Theoretical: 3hr/wk

Tutorial: - hr/wk

Practical: - hr/wk

EEE 403

(A) Power Electronic

1- Introduction: (9hrs)

Principle devices and characteristics: diode, power transistor, thyristor (SCR), GTO and triac, SCR dynamic properties at switching ON and OFF. Methods of SCR turning ON, turning OFF and protection, trigger circuit design, series and parallel operation of SCR, cooling.

2-Rectifiers: (12 hrs)

Uncontrolled, half and full controlled, half and full wave rectifiers, single phase half wave, biphase, bridge, 3-phase half wave and bridge, and p-pulse rectifiers, effects of FWD, Specifications of devices and transformers.

3- Converter Operation: (6 hrs)

Overlap, principls,2 pulse, 3 pulse, p pulse and bridge converters, FWD overlap, power factor and effects of overlap, regulation, inversion and delay angle control.

4- DC Line Commutation and Choppers: (6 hrs)

Inverter classifications, forced commutations and parallel capacitors, step down choppers, step up choppers.

5- Inverters: (6 hrs)

Analysis of single phase bridge and center tapped source inverters, square and quasi-square wave output, operation of 3-phase bridge inverter, square and quasi-square wave output, inverter voltage and frequency control technique.

6- Cyclo-converters: (3hrs)

Principles, circulating currents and blocked group operations, types and applications.

7- Single Phase AC Voltage Controllers: (3 hrs)

AC regulators, transformer tap changers, control of multi-winding transformers, integral cycle control.

(B) Machines

1-Single-Phase Induction Motor: (24 hrs)

Analysis of single phase IM using double revolving field theory, characteristics and windings of single phase IM, analysis of combined winding performance using revolving field theory, symmetrical components analysis, MMF components and components eliminations, general equivalent circuit and particular cases.

2-Two-Phase Servo Motors: (6 hrs)

Main requirements of servos, the IM as a servo motor, drug cup construction, introduction to tachogenerators and induction tachogenerators.

3- Shaded Pole Motors: (3 hrs)

Construction, principle of operation, speed reversal and speed changing.

4- Universal and Single Phase AC Series Motors: (3 hrs)

Principles, torque and speed equations, small universal and large AC motors, speed changing, applications.

5-Single-Phase Repulsion Motors: (3hrs)

Repulsion principles and repulsion motors, repulsion start IM, repulsion IM.

6- Stepper Motors: (6 hrs)

Permanent magnet stepper motors, variable reluctance stepper motors, torque-speed characteristics, step angle and speed.

University of mayssan

College of Engineering – Department of Electrical Engineering

Class: Fourth Year

Subject: Elective Subject- Microwave Engineering

Theoretical: 2hr/wk

Tutorial: -hr/wk

Practical: - hr/wk

EEE 407

1- Electromagnetic Theory: (8 hrs)

Maxwell's equations, plane wave solution, field components of plane wave, general development of the wave equation, plane wave propagation in lossy medium, plane wave in good conductor, plane wave in lossy dielectric.

2- Microwave Transmission Lines: (14 hrs)

Transmission line equation and their solutions, two conductors transmission lines, reflection coefficient, transmission coefficients, standing waves and standing wave ratio (SWR), line impedance and admittance, impedance in terms of reflection coefficients, determination of characteristic impedance and propagation constant, normalized impedance, line admittance, Smith charts, impedance matching, single-stub matching, double-stub matching.

3-Microwave Waveguides: (12 hrs)

Solutions of wave equations in rectangular coordinates, TE-modes in rectangular waveguides, TM-modes in rectangular waveguides, solution of wave equations in cylindrical coordinates, TE-mode in circular waveguides, TM-mode in circular waveguide.

4- Microwave Components: (10 hrs)

Resonant cavities, rectangular cavity resonators, circular cavity resonators, Q-factor of cavity resonator, microwave hybrid circuits, the s-parameter theory, prosperities of s-parameter, three point devices, directional couplers, circulators and isolators, hybrid couplers.

5-Microwave Solid State Devices: (10 hrs)

Microwave transistors, microwave characteristics, power gain (GP), maximum available power gain (GMAX), unilateral power gain, amplifier design with s-parameters, microwave oscillator design.

6- Microwave Filters: (6 hrs)

Specifications of power loss ratio, maximally flat filter characteristics, Chebyshev filters, frequency transformations, low pass to high pass transformations, low pass to band pass transformations, microwave half wave filter, microwave parallel coupled filters.

هذه المواد تغطي المتطلبات الثلاث وهي، المتطلبات الجامعية ومتطلبات الكلية ومتطلبات القسم وبواقع:-

١- ثلاثة مواد تشكل ١٤ وحدة وتمثل (٨,٨%) من مجموع الوحدات كمتطلبات جامعية.
٢- اربع مواد تشكل ٢٠ وحدة وتمثل (١٢,٦%) من مجموع الوحدات كمتطلبات كلية.
٣- سبع وعشرون مادة تشكل ١٢٤ وحدة وتمثل (٧٨,٥%) من مجموع الوحدات كمتطلبات قسموالجداول التالية توضح هذا التوزيع:-

University Requirements								
Code	Subject	Hours/Week						credit hours
		First Term			Second Term			
		Th.	Prac.	Tut.	Th.	Prac.	Tut.	
EEE101	Fundamentals of Democracy	2	-	-	2	-	-	4
EEE104	Computer Science	2	2	-	2	2	-	6
Total		٤	٢	-	4	٢	-	١٤

College Requirements								
Code	Subject	Hours/Week						credit hours
		First Term			Second Term			
		Th.	Prac.	Tut.	Th.	Prac.	Tut.	
EEE103	Engineering Drawing	-	3	-	-	3	-	2
EEE106	Mathematics (I)	3	-	1	3	-	1	6
EEE202	Mathematics (II)	3	-	1	3	-	1	6
EEE301	Eng. and Numerical Analysis	3	-	1	3	-	1	6
Total		٩	٣	٣	٩	٣	٣	٢٠

Department Requirements								
Code	Subject	Hours/Week						credit hours
		First Term			Second Term			
		Th.	Prac.	Tut.	Th.	Prac.	Tut.	
EEE102	Digital Techniques	2	1	-	2	1	-	5
EEE105	Principle of Mechanical Eng.	2	1	1	2	1	1	5
EEE107	Electronics (I)	2	-	1	2	0	1	4
EEE108	Basics of Electrical Eng.	3	-	1	3	-	1	6
EEE109	Laboratories	-	3	-	-	3	-	2
EEE203	Computer Programming	2	2	-	2	2	-	6
EEE204	Electronics (II)	2	-	1	2	-	1	4
EEE205	Electrical Circuits	2	-	1	2	-	1	4
EEE206	Electrical Machines (I)	2	-	1	2	-	1	4
EEE207	Electromagnetic Fields	2	-	1	2	-	1	4
EEE208	Laboratories	-	6	-	-	6	-	4
EEE302	Electrical Machines (II)	2	-	1	2	-	1	4
EEE303	Electrical Power	2	-	1	2	-	1	4
EEE304	Electronics (III)	2	-	1	2	-	1	4
EEE305	Communication (I)	3	-	1	3	-	1	6
EEE306	Microprocessor	2	-	-	2	-	-	4
EEE307	Control (I)	2	-	-	2	-	-	4
EEE308	Elective Subject	2	-	1	2	-	1	4
EEE309	Laboratories	-	6		-	6		4
EEE401	Engineering Project	1	3	-	1	3	-	4
EEE402	Communication (II)	3	-	1	3	-	1	6
EEE403	Power Electronics & Applications	3	-	-	3	-	-	6

EEE404	Electronics	3	-	-	3	-	-	6
EEE405	Power System Analysis	3	-	1	3	-	1	6
EEE406	Control (II)	3	-	1	3	-	1	6
EEE407	Elective Subject	2	-	-	2	-	-	4
Total		٥٤	٢٢	١٥	٥٤	٢٢	١4	١٢٤

يمكن تصنيف هذه المواد الى ثمانية مجاميع من التخصصات وكما يلي:-

١- مواد الرياضيات والتحليل العددي والتي تمثل ما مجموعه ١٨ وحدة.
٢- المواد التي تمثل أسس للهندسة الكهربائية والالكترونية وتحتل ما مجموعه ٤٩ وحدة.
٣- مواد في تخصص هندسة الاتصالات وتمثل ما مجموعه ١٢ وحدة.
٤- مواد في تخصص هندسة القدرة وتمثل ما مجموعه ٢٩ وحدة.
٥- مواد في تخصص هندسة النظم والسيطرة وتمثل ما مجموعه ١٠ وحدات.
٦- مواد في تخصص الحاسبات وتمثل ما مجموعه ٢٤ وحدة.
٧- المواد الإنسانية وتمثل ما مجموعه ٨ وحدات.
٨- مواد اختيارية وتمثل ما مجموعه ٨ وحدات.