

الرقم: 189 /2019/1

التاريخ: 2019/5/25

رئاسة الجامعة  
University Administration

الأستاذ الدكتور مدير وحدة القبول والتسجيل

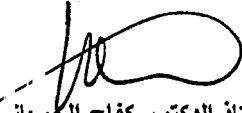
تحية طيبة وبعد،

ناقشت لجنة الخطة الدراسية في جلستها رقم (2019/2018/4) تاريخ (2019/5/16) اعتماد خطة برناه  
بكالوريوس في الهندسة الكهربائية، وبعد المناقشة قررت الموافقة على اعتماد الخطة المرفقة بأثر رجعي من العام  
الجامعي 2018/2017.

وتفضلوا بقبول فائق الاحترام والتقدير،،،

مقرر اللجنة

نائب الرئيس لشؤون الكليات الام



الأستاذ الدكتور كفاح الجاه

- نسخة/ نائب الرئيس لشؤون الكليات العلمية.
- نسخة/ كلية الهندسة / لاعتماد الخطة.
- نسخة/ مركز الاعتماد وضمان الجودة/ لاعتماد الخطة.

School	School of Engineering
Department	Electrical Engineering Department
Program title (English)	B.Sc. in Electrical Engineering
Program title (Arabic)	البكالوريوس في الهندسة الكهربائية

### 1. Components of Curriculum

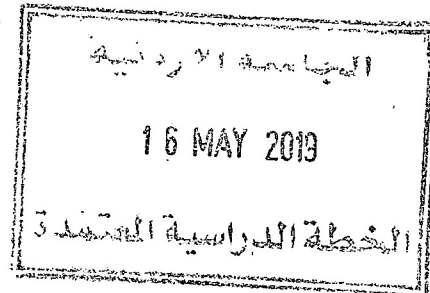
The curriculum for the bachelor's degree in Electrical Engineering consists of (162) credit hours distributed as follows

Number	Type of requirement	Credit hours
First	University Requirements	27
Second	School Requirements	23
Third	Department Requirements	112
Fourth	Other Requirements	0
<b>Total</b>		<b>162</b>

### 2. Course Numbering System

A- Department number (fourth digit from left in course number)

Number	Department
0	General to All Departments
1	Civil Engineering
2	Architectural Engineering
3	Electrical Engineering
4	Mechanical Engineering
5	Chemical Engineering
6	Industrial Engineering
7	Computer Engineering
8	Mechatronics Engineering



**B- Course domain number (sixth digit from left in course number)**

Domain number	Domain title	Domain number	Domain title
0	General	5	Electromagnetics
1	Circuits	6	Electronics
2	Communications	7	Machines
3	Computer	8	Power
4	Measurements & Control	9	Project

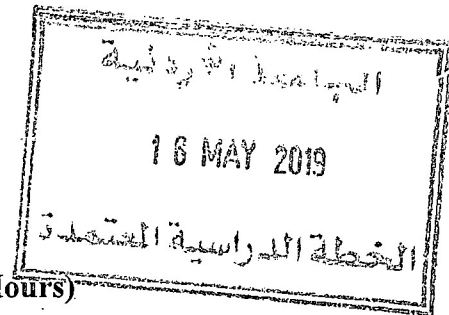
**C- Course numbers are 7 digit numbers, the meaning of each digit is shown below**

School number		Department number		Course level	Course domain	Course serial number
0	9	0 - 9	3	1 - 5	0 - 9	0 - 9

**Components of Curriculum**

**First: University requirements: (27) credit hours distributed as follows**

**Compulsory University Requirements (18 Credit Hours)**



Course Number	Course Title	Credit Hours	Pre-requisite	Notes
2220100	Military Science	3	-	
3400100	National Culture	3	-	
3400101	Learning & Research Skills	3	3201099 & 3202099 & 1932099	
3400102	Communication Skills	3	3400101	
3400103	Introduction to Philosophy and Critical Thinking	3	3400101	
3400104	Human Civilization	3	-	
3400105	Campus Life and Ethics	0	-	One hour weekly meeting

University Elective Courses (9 Credit Hours)

(3 Credit Hours from Each Group below)

(First Group)

Course Number	Course Title	Credit Hours	Pre-requisite	Notes
0400101	Islam and Contemporary Issues	3	-	
2300101	Arab-Islamic Civilization	3	-	
2300102	Jordan: History and Civilization	3	-	
3400107	Great Books	3	-	
3400108	Jerusalem	3	-	

(Second Group)

16 MAY 2019

Course Number	Course Title	Credit Hours	Pre-requisite	Notes
0300102	Environmental Culture	3	-	
0400102	Islamic Culture	3	-	
0720100	Health Culture	3	-	
1000102	Legal Culture	3	-	
1100100	Physical Fitness Culture	3	-	

(Third Group)

Course Number	Course Title	Credit Hours	Pre-requisite	Notes
1600100	Electronic Commerce	3	-	
1601105	Management Skills	3	-	
1900101	Social Media	3	-	
2000100	Appreciation of Arts	3	-	
2200103	Foreign Language	3	-	
3400106	Special Subject	3	-	
3400109	Entrepreneurship & Creativity	3	-	



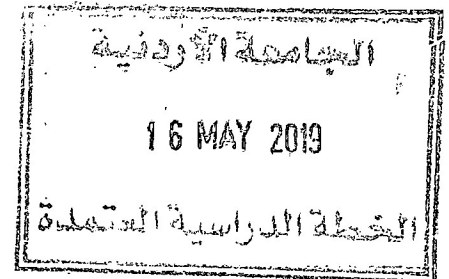
**Second: School requirements: (23) credit hours distributed as follows**

**Compulsory School Requirements (23 Credit Hours)**

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theory	Practical		
0301101	Calculus I	3	-	3	-
0301102	Calculus II	3	-	3	0301101
0302101	General Physics I	3	-	3	-
0302111	Practical Physics I	-	3	1	0302101*
0904131	Engineering Graphics & Descriptive Geometry	2	2+2	3	-
0966111	Engineering Workshops	-	3	1	-
0966201	Technical Writing	1	-	1	3202100
0901420	Engineering Economy	3	-	3	Passing 90 credit hours
0908200	Introduction to Engineering	2	-	2	-
1931102	Computer Skills for Scientific Faculties	3	-	3	1902098 & 1932099

\* Pre-requisite or Co-requisite

School Elective Courses: None



الجامعة الأردنية

16 MAY 2019

Third: Department Requirements: (112) credit hours distributed as follows

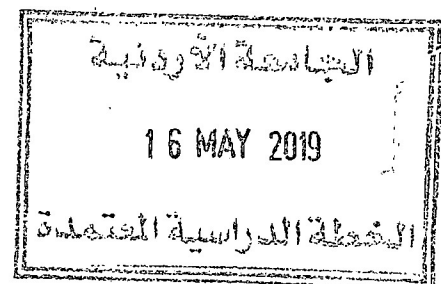
الخطة الدراسية المستلزمة  
Compulsory Department Requirements (94 Credit Hours)

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theory	Practical		
0303101	General Chemistry I	3	-	3	-
0301201	Calculus III	3	-	3	0301102
0302102	General Physics II	3	-	3	0302101
0302112	Practical Physics II	-	3	1	0302102*
0903211	Electrical Circuits (I)	3	-	3	0302102
0903212	Electrical Circuits (II)	3	-	3	0903211
0903219	Circuits Lab.	-	3	1	0903212*
0907231	Digital Logic	3	-	3	1902098 & 1932099
0907234	Digital Logic Lab	-	3	1	0907231
0903261	Electronics (I)	3	-	3	0903211
0903361	Electronics (II)	3	-	3	0903261
0933368	Electronics Lab	-	3	1	0903361*
0301202	Engineering Mathematics I	3	-	3	0301201
0331302	Engineering Mathematics II	3	-	3	0301202
0903251	Electromagnetics (I)	3	-	3	0302102
0903351	Electromagnetics (II)	3	-	3	0903251
0953221	Signal Analysis & Systems	3	-	3	0933201 & 0903211
0953321	Probability and Random Variables	3	-	3	0953221
0907235	Assembly Language & Microprocessors	3	-	3	0907231
0907333	Embedded Systems	3	-	3	0907231 & 0903261

0907334	Embedded Systems Lab	-	3	1	0907333
0933201	Computer Applications	-	2	1	1931102
0953421	Communications (I)	3	-	3	0953321*
0953422	Communications (II)	3	-	3	0953421
0953429	Communications Lab	-	3	1	0953422*
0943424	Digital Signal Processing	3	-	3	0953321
0943301	Engineering Numerical Methods	3	-	3	0301202
0933341	Instrumentation & Measurements	3	-	3	0953321* & 0903261
0933441	Control Systems	3	-	3	0331302
0903448	Measurements & Control Lab.	-	3	1	0933341 & 0933441
0943461	Power Electronics	3	-	3	0903361
0903371	Electrical Machines (I)	3	-	3	0903212 & 0903251
0903471	Electrical Machines (II)	3	-	3	0903371
0903478	Machines Lab	-	3	1	0903471*
0933481	Power System Analysis (I)	3	-	3	0903371
0933482	Power System Analysis (II)	3	-	3	0933481
0903489	Electrical Power Lab.	-	3	1	0933482*
0973598	Project (I)	-	-	1	Passing 120 credit hours
0973599	Project (II)	-	-	2	0973598

\* Pre-requisite or Co-requisite.

\*\* The senior design project spans two regular semesters, after which the final grade is assigned.



Department Elective Courses (18 Credit Hours)

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theory	Practical		
0903425	Communication Systems	3	-	3	0953421
0903426	Communication Networks	3	-	3	0953421
0943521	Communication Circuits	3	-	3	0953422
0953522	Cellular Communications	3	-	3	0953422
0953523	Telephone Communication Systems	3	-	3	0953422
0943524	Optical Communications & Laser	3	-	3	0953421
0943529	Selected Topics in Communications	3	-	3	0953421
0933551	Antennas & Wave Propagation	3	-	3	0903351
0903549	Selected Topics in Control	3	-	3	0933441
0933462	Digital Electronics	3	-	3	0903361
0903561	Medical Electronics	3	-	3	0903361
0943582	Electrical Drives	3	-	3	0943461
0963581	Power System Reliability	3	-	3	0933482
0943483	Power System Protection	3	-	3	0933482
0943589	Selected Topics in Power & Machines	3	-	3	0933482

الجامعة الأردنية  
16 MAY 2019  
الخطة الدراسية المتعلقة

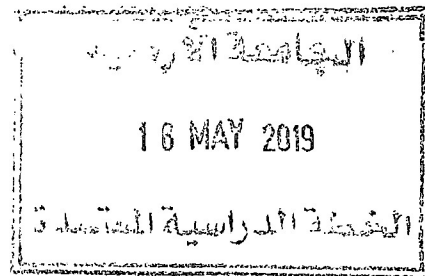
**Fourth: Other Requirements: (0) credit hours**

**Compulsory General Requirements (0 - 15 Credit Hours)**

Course Number	Course Title	Credit Hours	Pre-requisite	Notes
3201098	Arabic Placement Test	0	-	Pass/Fail
3201099	Basics of Arabic	3	3201098	Pass/Fail
3201100	Arabic Language Skills	3	3201098 & 3201099	Pass/Fail
3202098	English Placement Test	0	-	Pass/Fail
3202099	Basics of English	3	3202098	Pass/Fail
3202100	English Language Skills	3	3202098 & 3202099	Pass/Fail
1932098	Computer Skills Placement Test	0	-	Pass/Fail
1932099	Basics of Computing	3	1932098	Pass/Fail
0900150	Community Service	0	-	Pass/Fail
0900500	Practical Training	0	Passing 120 credit hours	Pass/Fail

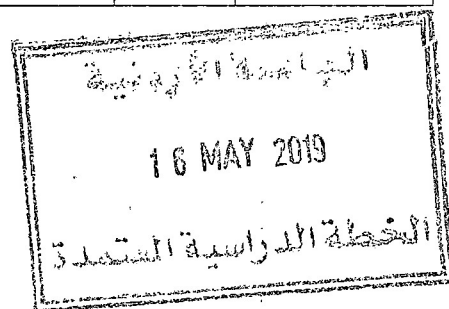
\* Students sit for placement tests in Arabic, English and Computer Skills after enrolling at the university. Based on the grades students achieve in these exams, they may be required to take one or more courses in Arabic Language, English Language or Basics of Computing. These courses do not count as part of the credit hours needed to receive the B.Sc. degree.

\* Students are permitted to start practical training only after successfully passing 120 credit hours out of their plan, in accordance with the school of engineering regulations. The training is performed in an organization related to electrical engineering and approved by the department. The training counts as 0 credit hours.



**Fifth: Courses offered to other schools and departments**

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theory	Practical		
0903203	Electrical Engineering	3	-	3	0302102
0903204	Electrical Engineering Lab	-	3	1	0903203
0973373	Electrical Machines	3	-	3	0903203
0933374	Electrical Machines Lab	-	3	1	0973373
0903253	Electromagnetics	3	-	3	0302102



**Sixth: Advisory Study Plan**

**First Year**

First Semester			Second Semester		
Course Number	Course Title	Cr. Hr.	Course Number	Course Title	Cr. Hr.
0301101	Calculus I	3	0301102	Calculus II	3
0302101	General Physics I	3	0302102	General Physics II	3
0302111	Practical Physics I	1	0302112	Practical Physics II	1
0303101	General Chemistry I	3	0904131	Engineering Graphics & Descriptive Geometry	3
1931102	Computer Skills for Scientific Faculties	3	0966201	Technical Writing	1
3400105	Campus Life and Ethics	0	0908200	Introduction to Engineering	2
0966111	Engineering Workshops	1	-----	University Requirement	3
<b>Total</b>		<b>14</b>	<b>Total</b>		<b>16</b>

Second Year

First Semester			Second Semester		
Course Number	Course Title	Cr. Hr.	Course Number	Course Title	Cr. Hr.
0903211	Electrical Circuits (I)	3	0903212	Electrical Circuits (II)	3
0301201	Calculus III	3	0903261	Electronics (I)	3
0933201	Computer Applications	1	0301202	Engineering Mathematics I	3
0903251	Electromagnetics (I)	3	0953221	Signal Analysis & Systems	3
0907231	Digital Logic	3	0903219	Circuits Lab.	1
0907234	Digital Logic Lab	1	-----	University Requirement	3
-----	University Requirement	3			
<b>Total</b>		<b>17</b>	<b>Total</b>		<b>16</b>

16 MAY 2019

الخطة الدراسية المستحدثة

Third Year

First Semester			Second Semester		
Course Number	Course Title	Cr. Hr.	Course Number	Course Title	Cr. Hr.
0903361	Electronics (II)	3	0903351	Electromagnetics (II)	3
0907333	Embedded Systems	3	0903371	Electrical Machines (I)	3
0953321	Probability and Random Variables	3	0943301	Engineering Numerical Methods	3
0933341	Instrumentation & Measurements	3	0907235	Assembly Language & Microprocessors	3
0331302	Engineering Mathematics II	3	0933368	Electronics Lab	1
-----	University Requirement	3	0907334	Embedded Systems Lab	1
			-----	University Requirement	3
<b>Total</b>		<b>18</b>	<b>Total</b>		<b>17</b>

**Fourth Year (Training is conducted during the summer period worth 3 Cr. Hr.)**

First Semester			Second Semester		
Course Number	Course Title	Cr. Hr.	Course Number	Course Title	Cr. Hr.
0953421	Communications (I)	3	0953422	Communications (II)	3
0933481	Power System Analysis (I)	3	0933482	Power System Analysis (II)	3
0933441	Control Systems	3	0943461	Power Electronics	3
0903471	Electrical Machines (II)	3	0903489	Electrical Power Lab.	1
0903478	Machines Lab	1	0903448	Measurements & Control Lab.	1
0903---	Department Elective	3	0903---	Department Elective	3
			-----	University Requirement	3
<b>Total</b>		<b>16</b>	<b>Total</b>		<b>17</b>

16 MAY 2019

الخطة الدراسية المتعددة

**Fifth Year**

First Semester			Second Semester		
Course Number	Course Title	Cr. Hr.	Course Number	Course Title	Cr. Hr.
0973598	Project (1)	1	0973599	Project (2)	2
0943424	Digital Signal Processing	3	0903---	Department Elective	3
0901420	Engineering Economy	3	0903---	Department Elective	3
0953429	Communications Lab	1	-----	University Requirement	3
0903---	Department Elective	3	-----	University Requirement	3
0903---	Department Elective	3			
-----	University Requirement	3			
<b>Total</b>		<b>17</b>	<b>Total</b>		<b>14</b>



## Course Description

### 0933201 Computer Applications

(1 Cr. Hr.)

#### Prereq. (1931102)

Computer packages for mathematical and symbolic manipulations (MATLAB, Mathematica). MATLAB variables, vectors and matrices. Built-in functions. Operator precedence. Matrix indexing. Complex numbers. Polynomials. Cells arrays. Structures. Script Files. User Input/Output. User defined functions. Local vs. global variables. Program writing skills. Flowchart versus pseudocode. Relational operators and conditional statements. Flow control structures and loops. Plotting. Figure annotations. Numerical solutions for various calculus problems: differentiation, integration, ordinary differential equations, etc. MATLAB symbolic engine. Using symbolic capabilities for linear algebra, calculus and other problems. Introduction to Simulink and its libraries. Simulating some engineering systems and finding solutions. Practical exercises.

### 0903203 Electrical Engineering

(3 Cr. Hrs.)

#### Prereq. (0302102)

Ohm's and Kirchhoff's Laws. Series and parallel connections. Voltage and current division. Nodal and mesh analysis. Superposition. Thevenin and Norton theorems. Inductance and capacitance. Source free RL and RC circuits. Response of RL and RC and RLC circuits to unit step function. Characteristics of a sinusoid. The phasor concept. Phasor relationships for R, L, and C elements. Impedance and admittance. Effective values of current and voltage. Instantaneous, average and apparent power and power factor. Three-phase Y and  $\Delta$  connections. Introduction to semiconductors. The PN junction. Applications of PN junctions (rectifiers). Transistors; operation, model, V-I characteristics. Operational amplifiers and gates. Safety considerations. Protective earthing.

### 0903204 Electrical Engineering Lab

(1 Cr. Hr.)

#### Prereq. (0903203)

Electric measuring equipment. DC circuits. Basic Laws and network theorems. Impedance concept and phase shift in RL and RC circuits. Three-phase wye and delta connected loads. Measurement of power and power factor. Transistor amplifiers. Operational amplifiers (Op-Amps).

### 0903211 Electrical Circuits (1)

(3 Cr. Hrs.)

#### Prereq. (0302102)

Units, definitions, and simple circuits. Circuit analysis techniques. Inductance and capacitance. Source-free RL and RC circuits. The application of unit-step forcing functions. The RLC circuits. The sinusoidal forcing function. The phasor concept. The phasor relationships for R, L, and C. Impedance/admittance. The sinusoidal steady state response. Circuit analysis using MATLAB and SPICE.

### 0903212 Electrical Circuits (2)

(3 Cr. Hrs.)

#### Prereq. (0903211)

Average power and rms values. Polyphase circuits. Three phase Y and  $\Delta$  connections. Complex frequency. The damped sinusoidal forcing function. Frequency response. Parallel and series resonance. Magnetically coupled circuits. General two port networks. Impedance, admittance, hybrid and transmission parameters. Principles of basic filtering. Basic passive and active filters.

### 0903219 Circuits Lab.

(1 Cr. Hr.)

#### Prereq./Coreq. (0903212)

DC circuits. Kirchhoff's voltage law (KVL). Network theorems. Transient analysis in RL, RC, and RLC circuits. Impedance concept. Power and power factor (PF). Series and parallel resonance. Quality factor. Three phase circuits. Power measurement. Parameters of two-port networks. Coupled circuits. Filters.

16 MAY 2019

الخطة الدراسية الجديدة

**0953221 Signal Analysis & Systems**

(3 Cr. Hrs.)

**Prereq. (0933201 & 0903211)**

Signal and system model and classification. Continuous time signals. Signals and vectors. Generalized Fourier series representation. Amplitude and phase spectra of signals. Energy and power content of signals. Bandwidth of signals. The Fourier transform and its applications. Sampling of signals. Convolution of signals. Power and energy spectral densities. Correlation functions. Time-domain analysis of continuous time systems. The system impulse response. Communication channels. Filters: LPF, HPF and BPF. Discrete time signals. The discrete Fourier transform (DFT) and the Fast Fourier transform (FFT). Spectral analysis of DFT systems. Unit sample response and response to arbitrary input sequences. Introduction to the Z-transform. Project.

**0903251 Electromagnetics (1)**

(3 Cr. Hrs.)

**Prereq. (0302102)**

Introduction. Vectors and vector operations. Coordinate systems. Coulomb's law and electric field. Potential and gradient. Electric flux density. Gauss law and divergence theorem. Electric fields in material space. Capacitors. Boundary conditions, Poisson's and Laplace's equations. Method of images. Biot-Savart's law. Ampere's law. The curl and Stock's theorem. Magnetic force, torque and moment. Magnetic vector potential. Practical applications. Magnetic properties of materials. The B-H curve. Boundary conditions. Inductors. Magnetic circuits. Interaction between fields and charged particles. Faraday's law. Displacement current. Maxwell's equations. Continuity equation and the relaxation relationship. Time-harmonic fields and the hysteresis concept.

**0903253 Electromagnetics**

(3 Cr. Hrs.)

**Prereq. (0302102)**

Introduction. Vectors and coordinate systems. Charges. Electric field. Potential and electric flux density. Gauss law. Electric characteristics of materials. Capacitors. Boundary conditions. Currents. Magnetic fields. Ampere's law. Magnetic properties of materials and the B-H curve. Boundary conditions. Inductors. Magnetic circuits. Time varying fields and Maxwell's equations. Waves in lossless and conducting media. Transmission lines (TL). Transient and steady state analysis of TL. Matching in TL. Introduction to optical fibers. Electromagnetic effects in high speed digital systems. Practical applications.

**0903261 Electronics (1)**

(3 Cr. Hrs.)

**Prereq. (0903211)**

Introduction to semiconductors. Conduction in metals. Intrinsic and extrinsic semiconductors. Electrical properties of semiconductors. Diffusion process in semiconductors. The PN junction diode. Open-circuited junction. Forward, reverse biased junction. VI static characteristics. Temperature effects. Small and large-signal models. Junction capacitance and switching times. Diode types and applications. Rectification. Rectifier filters. Clipper and clamper circuits. Voltage multipliers. Zener, varactor and Schottky diodes. LED and Photodiode applications. Bipolar Junction Transistors (BJT): Ebers-Moll mode. CB and CE characteristics. DC biasing and analysis. BJT as a switch and amplifier. Small-signal models. Transistor ratings. Field-effect Transistor (FET): VI characteristics of JFET and MOSFET. FET transistor as a switch and amplifier. Small-signal models. The MOSFET transistor. Transistor ratings.

**0943301 Engineering Numerical Methods**

(3 Cr. Hrs.)

**Prereq. (0301202)**

Mathematical preliminaries, numerical errors, loss of significance and error propagation. Numerical solution of nonlinear algebraic equations. Review of linear algebra (solution of systems of linear equations). Numerical solutions of systems of linear and non-linear algebraic equations. Interpolation and approximation and curve fitting. Numerical differentiation and integration. Numerical solution of differential equations. Eigenvalue problems. Introduction to numerical solution of partial differential equation. Engineering applications.

16 MAY 2019

الخطة الدراسية

**0953321 Probability and Random Variables**

(3 Cr. Hrs.)

**Prereq. (0953221)**

Introduction to probability and random variables. Discrete random variables. Continuous random variables. The probability density function. The probability distribution function. Statistics of random variables. Random processes. Ergodicity and stationarity. Auto-correlation function. Power spectral density. Estimating the autocorrelation function and power spectral density from raw data. Input output relations of linear systems.

**0907235 Assembly Language & Microprocessors**

(3 Cr. Hrs.)

**Prereq. (0907231)**

Introduction to microprocessors and microcomputers. Evolution, architecture, and software model. Introduction to Real-mode and protected-mode memory addressing. Addressing modes. The PC and its DEBUG program. Move, stack, load-effective address, and string instructions. Arithmetic instructions. Addition, subtraction and comparison. Multiplication and division. Logic instructions. Shifts and rotates. Counters and time delays. String comparisons. Jump instructions. Code conversion. Stacks and subroutines. Program and machine control instructions. Software interrupts. Program development. The microprocessor and its bus architecture. Introduction to memory and I/O interface.

**0933341 Instrumentations & Measurements**

(3 Cr. Hrs.)

**Prereq. (0953321\* & 0903261)**

General electric and magnetic units. Experimental data and error. Analyzing measurements using statistical analysis methods: measures of central tendency (mean, median, mode), measures of variation (range, interquartile, variance, standard deviation, coefficient of variation, Chebyshev's rule and empirical rule), graphical data analysis, frequency distributions, standard error, goodness of fit. Analog and digital instrumentation of current, voltage and power. R, L, C components measuring instruments. RF power and voltage measurement. Oscilloscopes. Signal generation and analysis. Wave and spectrum analyzers. Transducers. Digital data acquisition and test systems. Capacitive interference. Grounding. Project.

**0903351 Electromagnetics (2)**

(3 Cr. Hrs.)

**Prereq. (0903251)**

Introduction. Maxwell's equation. Wave equation. Plane wave (PW) in general medium. Wavelength, wave number, direction of wave propagation, phase velocity, group velocity, phase and attenuation constants and wave impedance. PW propagation in lossless, lossy and good conducting media. Skin effect and the surface impedance in lossy and good conducting media. Generalized form of the PW. Poynting vector. Normal and oblique incidence of the UPW. Wave polarization. Consideration of some practical problems. Transmission lines (TL). Transient analysis of lossless TL. Analysis of TL for harmonic source using vector and crank diagram. Short TL (stubs). TL charts. Matching using single stub, double stubs and quarter wavelength TL. Impedance measurement. Waveguides. Rectangular and circular waveguides. Slots in waveguide. The concept of resonant cavity. Introduction to antennas including the different parameters of an antenna. Short and half a wavelength dipoles characteristics.

**0903361 Electronics (2)**

(3 Cr. Hrs.)

**Prereq. (0903261)**

Amplification. Biasing of transistor (BJT and FET). Single-stage amplifier. Cascaded BJT and FET amplifiers. Composite transistor stages. Operational amplifiers and Applications: Differential amplifier. Operational amplifier architectures. Gain with active load. DC level shifting. Output stage. Offset voltages and currents. Frequency response of amplifiers. The high-frequency response of all amplifier configurations. The low-frequency response of all amplifier configurations. The frequency response of cascaded stages. Feedback Amplifiers. Properties of negative-feedback amplifiers. Properties of feedback amplifier topologies. Analysis of feedback amplifiers.

1.0 MAY 2019

الخطة الدراسية المتعددة

**0933368 Electronics Lab.**

(1 Cr. Hr.)

**Prereq./Coreq. (0903361)**

Rectification. Regulation and clipping. BJT characteristics. Bipolar Junction Transistor (BJT) biasing and large-signal amplification. BJT as an amplifier. FET as an amplifier. Cascaded amplifiers. Frequency response of amplifiers. Feedback amplifier. Differential amplifier. Op-Amp Applications. Projects.

**0903371 Electrical Machines (1)**

(3 Cr. Hrs.)

**Prereq. (0903212 & 0903251)**

Magnetic circuits. Single-phase transformers: principles, analysis and performance characteristics. Three-phase transformers: construction, connections and vector groups. Single-phase and three-phase transformer testing. Electromechanical energy conversion. Basic principles of DC mechanics. Principles and classification of DC generators. DC motors: analysis, performance characteristics, starting and speed control. DC machines testing. Rotating field. Synchronous generators: classification, analysis, performance characteristics, synchronization process and parallel operation.

**0973373 Electrical Machines**

(3 Cr. Hrs.)

**Prereq. (0903203)**

Magnetic circuits. Single-phase and three-phase transformers: principles, analysis, performance characteristics and testing. Electromechanical energy conversion. Principles and classification of DC generators. DC motors: analysis, performance characteristics, starting, testing and speed control. Synchronous motors: analysis, performance characteristics, applications, starting and testing. Three-phase induction motors: analysis, performance characteristics, applications, starting and speed control. Single-phase induction motors. Special types of motors: stepper motor, universal motor, reluctance motor, and brushless DC motor.

**0933374 Electrical Machines Lab.**

(1 Cr. Hr.)

**Prereq. (0973373)**

Transformer magnetic circuits. Testing of single and 3-phase transformers. DC generators. Speed control of DC motors. Testing and operational characteristics of alternators. Testing and operational characteristics of synchronous motors. Testing and operational characteristics of induction motors

**0953421 Communications (1)**

(3 Cr. Hrs.)

**Prereq./ Coreq. (0953321)**

Continuous-wave modulation (CW). Amplitude Modulation (AM). Angle modulation. Frequency and phase modulation (FM, PM). Bandwidth estimation in CW-modulation. AM and FM receivers. Noise in CW Modulation. Noise Sources. Interference and noise representation. Signal to noise ratio (SNR). Pulse modulation. Time division multiplexing (TDM). Pulse code Modulation (PCM). Delta modulation, DPCM. Baseband transmission: Pulse shaping and line coding. Nyquist's criterion for distortionless transmission. Digital transmission techniques: Binary ASK, FSK and PSK. Performance of digital modulation schemes in the presence of noise.

**0953422 Communications (2)**

(3 Cr. Hrs.)

**Prereq. (0953421)**

Introduction. Digital modulation formats. Optimum receiver design. Matched filter derivation and design of digital modulation formats. Signal space representation. Performance evaluation for digital modulation formats in AWGN channel. Probability of symbol and bit error for the different modulation formats. Fading channel models. Evaluation of the probability of symbol and bit error in fading channel. Spread Spectrum Communication. Channel Coding. Hamming Codes. Convolutional Codes. Linear block codes. Error correcting capability of linear block codes.

16 MAY 2019

**0943424 Digital Signal Processing**

(3 Cr. Hrs.)

**Prereq. (0953321)**

Introduction to Digital Signal Processing (DSP). Discrete time signals and systems. Z-transform. Modeling and implementation forms of discrete time systems. Time and frequency domain analysis of digital processors. Design and analysis of finite impulse response filters (FIR). Analog filter approximations. Design and analysis of infinite impulse response (IIR) filters. Digital filter networks. Digital equalizers. The DFT and FFT algorithms. DSP algorithms and applications.

**0903425 Communication Systems**

(3 Cr. Hrs.)

**Prereq. (0953421)**

Review of voice and data Communications. Line transmission and voice companders. Waveform shaping and data generation. Multiple access techniques: TDMA, FDMA, CDMA and hybrid systems. Propagation models and antennas. Broadcasting systems. Analog and digital TV systems. AM and FM broadcasting. Microwave and optical fiber links. Satellite communications. Satellite transponders, link budget calculation. GPS Systems: satellite configuration, timing signals, modulation and location calculations.

**0903426 Communication Networks**

(3 Cr. Hrs.)

**Prereq. (0953421)**

Introduction to communication networks and the OSI model. Circuit switching and packet switching. Physical layer and transmission media. Asynchronous and synchronous transmission. Local loop access technologies. Data Link Layer Principles. IEEE 802.x Medium Access Control (MAC) protocols: LANs, MANs, WANs and PANs. The concept of internetworking and the Internet Protocol (IP), IP Specifications and supporting protocols (ARP, DHCP, ICMP, etc), Routing and switching in IP networks. Repeaters, Switches, Hubs, Bridges, Routers and Gateways. UDP and TCP transport layers. Internet applications.

**0953429 Communications Lab**

(1 Cr. Hr.)

**Prereq./Coreq. (0953422)**

Baseband binary transmission and matched filter receiver measurements. Generation and reception of incoherent binary ASK, PSK, and FSK signals. Waveform shaping. Eye diagram.

**0933441 Control System**

(3 Cr. Hrs.)

**Prereq. (0331302)**

Open-loop and closed-loop (feedback) control systems. Examples of feedback control systems. Review of complex variables and Laplace transform. Poles and element transfer function and block diagram. Modeling of physical systems: electrical, mechanical hydraulic and pneumatic systems. Linearization of nonlinear systems. System representations: system block diagrams and signal flow graphs. Overall transfer function, block diagrams reduction techniques and Mason's gain formula. Introduction to state-space representation. Sensitivity of open loop and closed loop control systems. Time response analysis and performance indices of first and second order systems. Dominant poles of high order systems. Routh-Hurwitz stability criterion. Steady state error coefficients. Design and effects of basic control actions and their combinations: proportional, integral and derivative. Effects of velocity feedback. Stability analysis using root locus. Bode diagrams and Nyquist stability criterion. Gain and phase margins, and obtaining transfer function using Bode diagrams. Introduction to analysis and design using state-space equations.

**0903448 Measurements & Control Lab.**

**Prereq. (0933341 & 0933441)**

Experiments on oscilloscope. Measurement of earth resistance. Instrumentation. Data acquisition. Signal generators. Interference and insulation. Open and closed loop systems. Servomechanism principles. The effect of gain, integral and derivative control, and velocity feedback on system performance. Frequency response measurements. Analog computer simulation. CAD of control systems. Control of liquid level and thermal systems.

**0943461 Power Electronics**

(3 Cr. Hrs.)

الجامعة الأردنية

16 MAY 2019



**Prereq. (0903361)**

Basic elements of power electronic systems. Applications of power electronics. Classification of power electronic controllers. Power semiconductor devices (PSD). Classification of PSD. V-I characteristics of the major PSD. Switching characteristics of PSD. Basic drive circuits of PSD. Line commutated converters. Single-phase half-wave rectifiers. Single-phase full-wave rectifier configuration. Three-phase half-wave and full-wave rectifiers. Single-phase and three-phase semi-converters. Inversion mode of operation. Performance characteristics of line commutated rectifiers. Introduction to AC switching controllers. Introduction to DC-to-DC converters. Introduction to DC-to-AC converters.

**0933462 Digital Electronics**

(3 Cr. Hrs.)

**Prereq. (0903361)**

Building blocks and design methodologies for constructing synchronous digital systems. Bipolar TTL vs. MOS implementation technologies. Standard logic (SSI, MSI, LSI, VLSI). Programmable logic (PLD, PGA). Finite state machine design. Digital computer building blocks. Semiconductor ROM and RAM. Timing circuits. Monostable and stable multivibrators. Analog-to-digital (A/D) and digital-to-analog (D/A) converters. Using computer-aided design software (PSpice, Verilog HDL, Xilinx, etc).

**0903471 Electrical Machines (2)**

(3 Cr. Hrs.)

**Prereq. (0903371)**

Synchronous motors: analysis, performance characteristics, application in power factor correction, and starting methods. Testing of synchronous machines. Three-phase induction motors: classification, analysis, performance characteristics, starting methods, testing, and speed control. Single-phase induction motors. Special types of motors: stepper motor, universal motor, reluctance motor, and brushless DC motor.

**0903478 Machines Lab**

(1 Cr. Hr.)

**Prereq./ concurrent (0903471)**

Transformer magnetic circuits. Testing of single and three-phase transformers. DC generators. Speed control of DC motors. Testing and operational characteristics of alternators. Testing and operational characteristics of synchronous motors. Testing and operational characteristics of induction motors.

**0933481 Power System Analysis (I)**

(3 Cr. Hrs.)

**Prereq: 0903371**

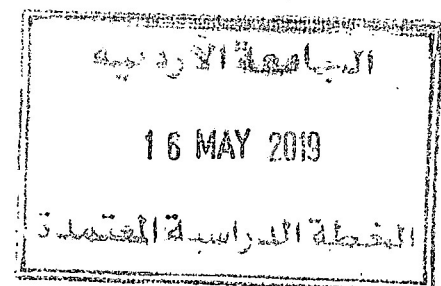
Introduction to sources of electrical energy and power system components. Basic concepts. Per unit quantities. Per unit calculations applied to power systems. The one-line diagram. Representation of transmission lines: current, voltage and power relations at both ends, reactive compensation. Symmetrical 3-phase fault calculations. Symmetrical components. Unsymmetrical faults calculations. Load flow: problem definition, Gauss-Seidel, Newton-Raphson (N-R), decoupled N-R methods.

**0933482 Power System Analysis (2)**

(3 Cr. Hrs.)

**Prereq: 0933481**

Power system protection: layout of substations, requirements and elements of protection systems, relays. Directional and non-directional over current and earth fault feeder protection. Differential protection as applied to feeders. Principles of distance protection. Economic operation of power systems: the transmission loss equation, an interpretation of transformation "C", classical economic dispatch, automatic generation control, unit commitment. Power system stability: rotor dynamics and the swing equation, the power angle equation, synchronizing power coefficient, equal-area criterion of stability, introduction to multi-machine stability studies.



**0943483 Power System Protection**

(3 Cr. Hrs.)

**Prereq: 0933482**

Review of basic principles. Electromechanical/solid state/computer relays. Current and voltage transformers: steady state and transient performance. Transformer protection. Generator protection. Motor protection. Busbar protection. Fuses: mechanism of interruption of overcurrent and short circuit currents. Maintenance and testing of relays.

**0903489 Electrical Power Lab.**

(1 Cr. Hr.)

**Prereq./Coreq. (0933482)**

Voltage distribution over a string of suspension insulators. i-t fuse characteristics. Measurement of symmetrical components in unbalanced systems. Transmission line parameters. Power flow relations at the ends of transmission lines. Earthing of power system neutral. Power system network analyzer. Comparison of the characteristics of static and electromechanical relays. Characteristics of time lag O/C relays. Differential relays. Directional relays. Power system load flow.

**0943521 Communication Circuits**

(3 Cr. Hrs.)

**Prereq. (0943422)**

Introduction and overview. Impedance matching and transformations. Oscillators types and circuits. Loop gain analysis. Negative resistance analysis. Voltage controlled Oscillators (VCO). Phase locked loops and applications. FM detection. Frequency synthesis. Mixers: Active mixers, Switching type mixers and 4-diode double balanced mixer. Conversion loss. Nonlinear effects. Mixers applications in modulation and demodulation. Tuner and resonant circuits. RF Filters. RF and IF tuned amplifiers. Power amplifiers. AGC circuits. Design of low noise amplifiers. Case studies. Projects: design, construct, match, and test an RF oscillator and amplifier.

**0953522 Cellular Communications**

(3 Cr. Hrs.)

**Prereq. (0953422)**

Introduction to telephony and traffic theory. Calculating the probability of blocking for parallel and series links. Cellular communication design and frequency assignment. Traffic management and call setup, hand-offs and calculating C/I ratio. Propagation models: Knife edge model and effect of multiple edges. Performance enhancement by proper cell site design and sectorization. Modulation for cellular systems. Probability of error rate performance in fading multi-path channels. Source and channel coding for cellular systems. Voice coders and GSM compression formats. Error correcting and convolutional codes. Interleaving and deinterleaving. Encryption and decryption. Case studies.

**0953523 Telephone Communication Systems**

(3 Cr. Hrs.)

**Prereq. (0953422)**

Introduction. Telephone circuits. Round trip attenuation and delay time effects. Echo canceling. Signaling systems. Private Automatic Branch Exchanges (PABX). Transmission planning. PCM, A-law, Mu-law companding. PCM hierarchy. TDM transmission systems and their hierarchy. Traffic Theory: Erlang B and C formulas, traffic and resources calculations. Digital exchanges. Switching techniques. Network synchronization, control and hierarchy. Synchronization. System controllers and CPU. Common channel control and distributed control. Data Networks and ISDN and packet switching. Open systems interconnection and ISDN networks. Data and control interface to other systems. Signaling systems.

**0943524 Optical Communications & Laser**

(3 Cr. Hrs.)

**Prereq. (0953421)**

Introduction. Step and graded index, multi-and single-mode optical fibers. Attenuation and dispersion. Guided wave propagation. Fields and modes in optical fibers. Principles of laser generation. Semiconductor lasers. Light amplifiers and their applications. Optical modulation techniques: direct modulation, external modulation. Multiplexing methods. Optical detectors and receivers. PIN, and APD. System performance. Optical integrated circuits. Practical considerations in optical systems. Optical communication systems: optical modem, digital optical networks. Introduction to nonlinear optics and soliton systems. Numerical simulation techniques in optical systems.

16 MAY 2019

**0943529 Selected Topics in Communications**

(3 Cr. Hrs.)

**Prereq. (0953421)**

Modern subjects in communication and/or electronics which educate students about new systems and technologies in the world of analog/digital communications or electronics working in the radio frequencies and microwaves, including the advantages of these systems. Radiators and antennas are also included.

**0903549 Selected Topics in Control**

(3 Cr. Hrs.)

**Prereq. (0933441)**

Modern subjects in control systems which educate students about modern digitals and analog control systems and technologies, and the advantages of these systems, and their different applications.

**0933551 Antennas & Wave Propagation**

(3 Cr. Hrs.)

**Prereq. (0903351)**

Introduction and Overview. Antenna Types. Antenna Parameters. Free Space Path loss. Mathematical formulation. Wire antennas: Short dipole, long and half-wavelength dipoles, standing and traveling wave antennas, wire antennas above the surface of the earth. Loop antennas. Antenna arrays analysis. Aperture antennas. Wave equation. Plane, cylindrical, and spherical waves. Wave components and wave polarization. Reflection, refraction and transmission of wave. Huygens principal. Physics of the atmosphere. Wave propagation in the troposphere. Space wave. Surface wave. Physics of the ionosphere. Wave propagation in the ionosphere. Sky wave. Effect of the earth magnetic field. Case studies.

**0903561 Medical Electronics**

(3 Cr. Hrs.)

**Prereq. (0903361)**

Introduction to medical instrumentation. Sensors and electrodes: resistive, inductive, and capacitive sensors. Piezoelectric sensors. Thermistors. Optical measurements. Introduction to biopotential signals. Biopotential amplifiers and signal processors. Cardiovascular system instrumentation: direct and indirect blood pressure measurement. Heart-sound measurement. Blood flowmeters. Plethysmography. Respiratory system instrumentation. Introduction to medical imaging systems: radiography. Computed tomography. Ultrasonic scanning. Therapeutic and prosthetic Devices: Cardiac pacemakers. Defibrillators and cardioverters. Ventilators. Infant incubators. Drug delivery devices. Electrosurgical unit. Electrical Safety.

**0903581 Power System Reliability**

(3 Cr. Hrs.)

**Prereq. (0933482)**

Introduction to the main electrical power subsystems: generation, transmission and distribution. Basic probability theory and distribution. Network modeling and evaluation of systems. Reliability analysis of generation: generating capacity, techniques, indices, interconnected systems, operating reserve. Reliability analysis of transmission: network configuration and indices. Reliability analysis of composite systems. Reliability analysis of distribution: Radial, parallel and meshed networks.

**0943582 Electrical Drives**

(3 Cr. Hrs.)

**Prereq. (0943461)**

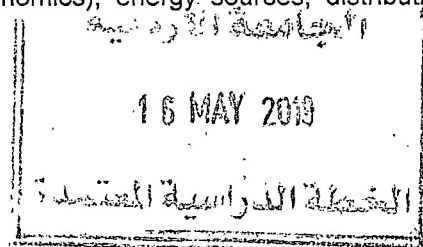
Classification of Mechanical loads; motors: classification and selection for drive systems; methods of speed control of DC motors; methods of speed control of AC motors; the need for speed control of electric motors; DC choppers and speed control of DC motors; controlled rectifiers and speed control of DC motors; Inverters and speed control of AC motors; soft starting of electric motors.

**0943589 Selected Topics in Power & Machines**

(3 Cr. Hrs.)

**Prereq. (0933482)**

Modern topics in electrical power systems or electrical machines to keep the student up-to-date in the areas of power generation (their policies and economics), energy sources, distribution systems and special machines.





**0973598 & 0973599 Project**

**(3 Cr. Hrs.)**

**Prereq. (Completing successfully 124 Cr. Hrs. from the student's plan)**

In part one, a problem is assigned to the student in one of the different electrical engineering tracks. He will be asked to rely on himself to find a solution for the problem (which could be practical or theoretical). It is expected from the student to develop the abilities of research and independent work and to train himself to observe a timetable to perform his project and to be capable of explaining and expressing his findings in a professional manner. In the second part, the student is required to finish the work he started in the first part. The student is required, whenever it is possible, to use the appropriate and available software to solve his problem, simulate his solution, to build a prototype and perform all needed measurements. The student will be required to write down his final year project as a complete report (dissertation) according to the department instructions.

