



Curriculum For The Bachelor Degree In Electrical Engineering/Electrical Power 2020



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Courses Description

BSE0205	Engineering Drawing	2(0-6)
Drawing instruments and their use, lettering, geometric construction, dimensioning, free-hand sketching, Orthographies, isometric projections, sketching and sectioning. Computer drawing using autocad (AutoCAD), engineering applications.		
Prerequisite: CS101		
BSE0102	Engineering Workshop	1(0-3)
Occupational safety and health in engineering workshops, mechanical forming of metals, machining operations, welding processes, carpentry works, electrical installation.		
Prerequisite: -		
BSC0401	Engineering Economy	3(3-0)
Engineering Economy: engineering economic concepts; interest formulas; decision making using present worth, future worth, annual worth, internal rate of return and benefit- cost ratio methods; payback analysis; depreciation.		
Prerequisite: 80 credit hours		
BSE 0201	Programming for Engineers	3(2-3)
This is a fast-paced introductory course to the C++ programming language. It is customized for the engineers with a little programming background. It covers C++ programming concepts, variables and basic data types, control structures and loops, functions; call by value and reference, arrays, structures, classes and objects, pointers and references to objects, files and streams. Weekly laboratory experiments will provide hands-on experience in topics covered in this course.		
Pre-requisite: CS101		
BSE 0306	Numerical Methods	BSE 0306
Errors analysis, roots of equations: bracketing and open methods, solutions of linear equations: gauss elimination, LU decomposition, matrix inverse, gauss-Seidel, curve representation and fitting, numerical differentiation and integration, solutions of differential equations: runge-kutta method, boundary-value and eigen-value problems.		
Prerequisite: 30202102		
BSE0203	Technical Writing & Professional Ethics	3(3-0)
This course deals with the definition of technical writing, its standards and how they differ from other types of writing. The basics of writing official reports, laboratory reports, projects and scientific papers. The common mistakes in writing and the process of writing citations and references. The concept of professional work and the definition of professional ethics and the acceptable and unacceptable professional practices. The sources of professional ethics and reasons for non-compliance with professional ethics. Identifying different forms of professions and explaining the importance of their relationship to ethics, standards of ethical behavior in science. Professional ethics in Jordanian laws and regulations.		
Prerequisite: AEL102		



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BSE 0202	Statistics and Probabilities for Engineers	3(3-0)
Descriptive mathematical and analytical statistics, probability, discrete and continuous random variables, probability density & distribution functions, statistics of random variables, random process, ergodicity & stationarity, autocorrelation function, power spectral density, estimating the autocorrelation function, power spectral density for raw data, input-output relation of linear systems and statistical hypothesis testing.		
Prerequisite: 30202102		
ELE 0211	Electrical Circuits (1)	3(3-0)
Units; Definitions: charge, current, voltage, power, energy, components of electrical circuits (independent and dependent sources, resistors, capacitors, inductors), Ohm's law, Kirchhoff's voltage and current laws, series, parallel, delta and star connections of the passive elements in electrical circuits, nodal and mesh analysis of electrical circuits, Thevenin and Norton Theorems, source transformation theorem, RL, RC and RLC circuits without source and with unit step forcing source.		
Prerequisite: 30201102		
ELE 0212	Electrical Circuits (2)	3(3-0)
Introduction to AC waveforms, AC RL, RC and RLC circuits, phasor diagram, impedance, resonant circuits, single phase and three phase circuits, magnetically coupled circuits and transformers, two-port networks, low pass, band pass and high pass filters.		
Prerequisite: ELE 0211		
ELE 0214	Electrical Circuits Lab	1(0-3)
DC circuits, Ohm's law, Kirchhoff's voltage and current laws, network theorems; transient analysis of RL, RC, and RLC circuits, impedance concept, power and P.F, series and parallel resonance, three phase circuits, magnetically coupled circuits, filters.		
Prerequisite: ELE0212*		
ELE 0213	Digital Logic Design	3(3-0)
Number Systems and digital waveforms. Basic gates and logic functions. Boolean algebra, Boolean expressions. Logic minimization techniques. VHDL basics. Design simulation and synthesis tools for programmable logic devices. Combination logic building blocks including decoders, encoders, multiplexers, demultiplexers and magnitude comparators. VHDL for combinational circuits. Digital arithmetic, adders and subtractors. VHDL for arithmetic circuits. Basics of sequential circuits. Basic latches and flip-flops. Timing parameters and diagrams. Counter, shift registers, basic PLDs, CPLDs and FPGAs architectures. VHDL for binary counters and shift registers. State machines. System Design with state machines using VHDL. Memory devices and systems including RAM, ROM, FIFO, LIFO and dynamic RAM.		
Prerequisite: BSE 0201		
ELE 0216	Electronics (1)	3(3-0)
Semiconductor diode, diode applications, BJT transistor, biasing circuits for BJT transistor, FET transistor, biasing circuits for FET transistor, transistor circuits models, small signal amplifiers.		
Prerequisite: ELE 0211		



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ELE 0216	Electronics Lab (1)	1(0-3)
Diode characteristics, rectification, regulation, limiting and clamping, BJT transistor characteristics and applications, FET transistor characteristics and applications.		
Prerequisite: ELE 0216		
ELE 0321	Signals and Systems	3(3-0)
Representation and classification of signals and systems, continuous-time signals and systems, Fourier series representation, Fourier transform and its applications, Laplace transform, analog filters: LPF, BPF and HPF, sampling theorem, discrete-time signals and systems, introduction to Z-transform.		
Prerequisite: ELE 0211		
ELE 0322	Communications and Data Transmission	3(3-0)
Analog and Digital signals, Analogue Modulation Techniques, Principles of Data Communications, Pulse Modulation Techniques, Error detection and correction, data compression, Line Coding Techniques, Frequency Division Multiplexing and Time Division Multiplexing.		
Prerequisite: ELE 0321+ ELE 0213+ ELE 0205		
ELE 0334	Control Systems	3(3-0)
Introduction to Control Systems, Mathematical Models of Systems, State Variable Models, Feedback Control System Characteristics, The Performance of Feedback Control Systems, The Stability of Linear Feedback Systems, The Root Locus Method, Frequency Response Methods, Stability in the Frequency Domain, The Design of Feedback Control Systems, The Design of State Variable Feedback Systems, Robust Control Systems.		
Prerequisite: ELE 0321		
ELE 0431	Control Systems Lab	1(0-3)
Time Response of first and Second order system, Study of characteristics, Transfer function of DC and AC motors, Characteristics of AC servo motor, Effect of feedback on DC servo motor, Effect of P, PD, PI, PID controller on a second order systems, State space model for classical transfer function using MATLAB – Verification, system identification, Lag and lead compensation – Magnitude and phase plot, verification of Routh Horvitz criteria, Root locus plotting.		
Prerequisite: ELE 0334		
ELE 0335	Electrical Machines (1)	3(3-0)
Magnetic circuits; single-phase transformers: types; construction; ideal and practical transformers; equivalent circuit; testing; voltage regulation and efficiency; three-phase transformers: construction; connections and groups; in-rush currents and harmonics; preventive maintenance and testing; direct current machines: construction and classification; elementary DC machine; excitation; windings; EMF; torques and power relations; armature reaction and commutation; DC generators: performance characteristics and applications; DC motors: performance characteristics; starting; speed control and applications preventive maintenance.		
Prerequisite: ELE 0212		



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ELE 0228	Microprocessors Systems	3(3-0)
Introduction to microprocessors and microcomputers. Microprocessors' evolution, architecture, programming model, buses and control signals. Introduction to Real-mode and protected-mode memory addressing. Introduction to Assembly programming (one of the latest 16-bit or 32-bit microprocessors can be chosen, e.g., Intel, Zilog, Motorola). Data movement instructions (different addressing modes), Arithmetic instructions: addition, subtraction, comparison, multiplication and division. Logical, shifts and rotate instructions. Stack, load-effective address, software interrupts and calling subroutine and macro. Jump instructions. Counters and time delays. String instructions. String comparisons. Code conversion. Program and machine control instructions. Direct Memory Access .Program development. Introduction to memory and I/O interface.		
Prerequisite: ELE 0213		
ELE 0328	Microprocessors Systems Lab	1(0-3)
Writing, implementing and debugging assembly programs on Intel x-86 microprocessors. The lab also provides the facility to interface the microprocessor with different circuits such as A/D converters, stepper motors, multi-digit displays, sensors etc.		
Prerequisite: ELE 0228		
ELE 0205	Linear Algebra	3(3-0)
Simultaneous linear equation systems and matrices. Gaussian elimination, orthogonal projection, Determinants, vector and matrix spaces, Inner product spaces, linear transformation. Eigenvalues and eigenvectors. Diagonalization and quadratic forms. Singular value decomposition. Modeling and applications in electrical engineering.		
Prerequisite: 30202102		
ELE 0541	Graduation Project (1)	1(0-1)
Project under the supervision of one of an academic staff in the department, on an assigned specification topic in the related specialization. This is the first part of the project; it will normally involve literature review, theoretical work and some laboratory or fieldwork.		
Prerequisite: pass 120 Cr. Hrs.		
ELE 0542	Graduation Project (2)	3(0-3)
Project 2 is the second part of the project and will normally involve design, analysis and conclusions of the study and the submission of a final report and discussion by a committee in the department.		
Prerequisite: ELE 0541		
ELE 0442	Field Training	3(0-3)
Training for 8 weeks in the field of the related specification in an approved public or private sector.		
Prerequisite: pass 115 Cr. Hrs.		
ELE 1311	Electric and electronic Measurements	3(3-0)
Measurements and the generalized measurement system. Analog instruments. Instrument		



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transformers. Measurement of power and energy. DC and AC bridges. Transducers. Electronic measuring instruments. Digital instruments. Oscilloscopes. Recording instruments. Prerequisite: ELE 0216		
ELE 0335	Electrical Machines (1)	3(3-0)
Magnetic circuits; single-phase transformers: types; construction; ideal and practical transformers; equivalent circuit; testing; voltage regulation and efficiency; three-phase transformers: construction; connections and groups; in-rush currents and harmonics; preventive maintenance and testing; direct current machines: construction and classification; elementary DC machine; excitation; windings; EMF; torques and power relations; armature reaction and commutation; DC generators: performance characteristics and applications; DC motors: performance characteristics; starting; speed control and applications preventive maintenance. Prerequisite: ELE 0212		
ELE 1352	Electrical Machines (2)	3(3-0)
Rotating magnetic field; MMF and flux distribution; synchronous generators: classification; construction; equivalent circuit; power and torque relationships; parallel operation; performance and characteristics; synchronous motors: principles; power flow and efficiency; starting; power factor correction and V-curve; 3-phase induction motors: types; construction and basic concepts; equivalent circuit; power and torque relations; power flow and performance characteristics; starting; speed control; single-phase induction motors: construction; classification; starting; equivalent circuit; and performance characteristics; preventive maintenance. Prerequisite: ELE0335		
ELE 1358	Electrical Machines Lab	1(0-3)
Transformer magnetic circuits; testing of single and 3-phase transformers; DC generators; speed control of DC motors; testing and characteristics of alternators; characteristics and applications of synchronous motors; characteristics and applications of induction motors. Prerequisite: ELE 0335		
ELE 1475	Electrical Installations & safety	3(3-0)
Electrical system design for residential; commercial plants: lighting and power distribution; motor branch feeders; switchboards; unit substation; earthing; light; photometry; light sources; electrical lamps; illumination calculations; testing and maintenance; codes and standards; power factor correction, fire alarms systems, project. Prerequisite: ELE1374		
ELE 1374	Power System Analysis I	3(3-0)
Review of three-phase systems; Power system components and single line diagram; per-unit system; transmission lines: short; medium and long; equivalent circuits and RLC parameters; cables; Y-bus and load flow studies; symmetrical fault analysis. Prerequisite: ELE 0212+ ELE 0335		
ELE 1473	Power System analysis II	3(3-0)
Z-bus methods in fault analysis; symmetrical components and sequence networks of synchronous machines and power transformers; unsymmetrical fault analysis; power system		



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stability and transients in power systems.		
Prerequisite: ELE1374		
ELE 1476	Electrical Installations & safety Lab	1(0-3)
Electrical wiring circuits; lighting wiring circuits; lighting control; signaling circuit; intercom circuits; fire and burglar alarm circuits; Motor starting circuits; earthing resistance measurements.		
Prerequisite: ELE1475		
ELE 1474	Electric Power Lab	1(0-3)
Power system simulators; equivalent circuits at power system components; Equivalent circuits at transmission lines; voltage regulation; reactive power compensation; line losses; various types of loads;		
Prerequisite: ELE1374		
ELE 1471	Power Systems Protection	3(3-0)
Principles; elements and requirement; Voltage & Current transformers; electromechanical; static and numerical relays; over current and earth fault protection; differential and distance protection; protection of power system elements: generator; transformer; bus-bars; lines and motors; testing and maintenance of protection components.		
Prerequisite: ELE1374		
ELE 1472	Power Systems Protection Lab	1(0-3)
Current and voltage transformers (Single phase 3-phase); performance of CT; relays (electromechanical; static and digital): instantaneous over current; inverse time over current including IDMT; VIDMT and EMIDT Directional O/C relay; differential and distance relay; over voltage and under voltage time lag relays; discrimination on O/C relays by both time and current; experiments on power system simulator; experiments on high voltage equipment.		
Prerequisite: ELE1471		
ELE 1479	Power Transmission and Distribution	3(3-0)
Design concepts, Transmission Line Design (Introduction, Voltage selection, Cross-sectional area of conductors, Distance between towers, number of conductors, Transmission circuit). Insulation design, Earthing and selection of earthing conductors, The phenomenon of Corona, Substation grounding system (Reasons for substation grounding system, Permissible Touch and step voltages), Distribution System Planning and Design (Introduction, distribution system components, distribution substation site location, substation rating, Voltage drop calculation, case study (Design of distribution system).		
Prerequisite: ELE 1374		
ELE 2461	Electric Drive	3(3-0)
Elements of electric drive systems; the mechanical system; torque equation and steady-state stability; classification of load torques; braking; gear and belt drive; classification of motors and converters; selection of converters and motors (ratings and types). DC motor drive using controlled rectifiers; DC motor drive using choppers; induction motor drives: soft starters; control strategies; analysis and characteristics; synchronous motor drives: control strategies; analysis and characteristics.		
Prerequisite: ELE 2363+110 Cr.Hrs		



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ELE 1477	Modeling & Simulation of Power Systems	1(0-3)
Modeling and simulation basics; Modeling and simulation of stationary magnetically coupled devices; Modeling and simulation of electromechanical systems; Reference frame theory and its application for modeling of electric machines. Simulation of steady state and transient responses of electric power systems using PC applications as Matlab, Digsilent or any other software for power engineering		
Prerequisite: ELE 1473		
ELE 1579	Power System Operation & Control	3(3-0)
Introduction; power-frequency control; automatic generation control; load shedding; reactive power-voltage control; voltage control devices; active and reactive powers; optimal power flows; optimal operation of power system: economic and contingency analysis.		
Prerequisite: ELE 1473		
ELE 1571	High Voltage Engineering	3(3-0)
H.V. generation for testing purposes; H.V. measurements; break down in gasses; cathode processes and secondary effects; streamers and Kanal mechanism; Paschen's law; partial discharges and corona; break down in solid insulation; over voltages caused by dart leaders: strokes to towers and to earth wires; attraction of lightning flashes to lines; shield angle; over-voltage limitations; surge diverters; arrestors and arcing horn;. External insulation; insulators function and types; clearance; creepage distance and contamination; insulation coordination.		
Prerequisite: ELE 1479		
ELE 1480	Renewable Energy Systems	3(3-0)
This course will provide in-depth understanding of the technology relevant to each type of renewable energy sources, especially solar and wind systems. Analysis techniques to evaluate renewable energy applications from a systems design and selection perspective will be presented. Topics include physical operating principles and theoretical vs. actual system outputs.		
Prerequisite: ELE1352 + ELE4311		
ELE 1570	Reliability of Power Systems	3(3-0)
Deterministic techniques for reliability evaluation; probability theory; probabilistic techniques for reliability evaluation of generation; transmission and distribution systems; cost of outages; reliability versus economics.		
Prerequisite: ELE1471 + ELE1479		

ELE 1578	Transient in electrical power systems	3(3-0)
Review of the Laplace transform; DC circuit transients; ac switching transients; transients in three-phase circuits; transients waves on transmission lines; over voltages during faults; lightning and insulation coordination; breaker failure analysis with a detailed arc model; arc restrikes and recovery voltage characteristics; switching surges; Ferro resonance and nonlinear phenomena.		
Prerequisite: ELE 1473+110 Cr.Hrs		



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ELE 1567	Economics and Resources of Power Systems	3(3-0)
Energy sources, types of electrical generating plants, generating plants operating on fuels and oil products, fuel transfer and processing systems, steam generation systems, steam turbines, auxiliary systems in plant, gas turbines, steam turbines operational details, single-stage and multi-stage gas turbines, Combined cycle steam turbines, hydroelectric power plants, nuclear power plants, alternatives of energy generation: renewable energy, solar power plants, solar collectors, wind power plants, biomass power plants, advantages of economical generation and operation units, Economical planning of integrated systems, Large-scale economies, reliability and regulation loss. Prerequisite: 110 Cr.Hrs+ELE 1473		
ELE 1478	Special Topics in Electrical Power	3(3-0)
Selected topics in electrical power engineering taught by faculty members and department agreement Prerequisite: 110 Cr.Hrs		
ELE2363	Power Electronics	3(3-0)
Power semi-conductor devices, parameters, switches, different loads with dc and ac sources; switches and diodes with different loads. introduction: Introduction to Thyristors and its family, static and dynamic characteristics, turn-on and turn - off methods and firing circuits and synchronizing circuits ;firing signal type, Ratings and protection of SCR'S, series and parallel operation. Phase Controlled Converters: Principle of phase control, Single phase and three phase converter circuits with different types of loads, continuous and discontinuous conduction, effect of source inductance, Dual converters and their operation .DC Choppers: Principle of chopper operation, control strategies, types of choppers, step up and step down choppers, steady state time domain analysis with R, L, and E type loads, voltage, current and load commutated choppers. Inverters: Single phase voltage source bridge inverters and their steady state analysis, modified Mc Murray half bridge inverter, series inverters, three phase bridge inverters with 180° and 120 °modes. single-phase PWM inverters, current source inverters, CSI with R load (qualitative approach). AC Voltage Controllers: Types of single-phase voltage controllers, single-phase voltage controller with R and RL type of loads. Cycloconverters: Principles of operation, single phase to single phase step up and step down cycloconverters, three phase to single phase cycloconverters, output voltage equation for a cycloconverter. [Pre-req.ELE0216]		
ELE2362	Power Electronics Lab	1(0-3)
Familiarization with power electronic components, Single phase full and half controlled converters, Three phase full and half controlled converters, Basic DC to DC converters, Single and two quadrant choppers, Single phase current source inverters, Speed control of DC motor, Familiarization with three phase variable frequency drive. [Pre-req.ELE2363]		