Philadelphia University

Faculty of Engineering and Technology

Electrical Engineering Department

Study Plan 2021-2022 Course description

Calculus (1) (216111)

Prerequisite (-----)

The course covers the following main topics: the distinction between algebraic and transcendental functions, an introduction to analytic geometry, applications of differentiation, and a brief introduction to integration.

Calculus (2) (250102)

Prerequisite 216111

This course presents advanced principles of calculus to provide the necessary foundation for student progression. It covers the following main topics: techniques of integration, sequences and series, conic sections, and polar coordinates

General Physics (1) (216131)

Prerequisite (-----)

This course is for first-year students majoring in engineering, physics, or other sciences. It introduces students to the basic language and ideas of physics that are found in all branches of science and technology. It provides a clear and logical presentation of the fundamental concepts and principles of physics, enhancing their understanding through a wide range of interesting real-world applications.

General Physics (2) (216132)

Prerequisite (216131)

The course covers the main concepts, principles, methods, and results of classical physics. It primarily covers Newtonian mechanics, with topics including vectors, the dynamics and motion of a single particle in one, two, and three dimensions, and circular motion. Newton's laws of motion, work, energy and force, conservation of energy, linear momentum, rotational motion, angular momentum, general rotation and static equilibrium; elasticity and fracture.

Engineering drawing620131 620132

Prerequisite (620131)

Instruments and their use, graphic geometry ،lettering, orthographic and isometric drawing and sketching, sectional views ،introduction to descriptive geometry, surface intersections and developments ،and computer (ACAD)

Engineering Workshop (1)

Prerequisite (-----)

Developing basic skills in the fields of manual filing, turning (lathe work), welding, piping and plumbing, carpentry, sand casting, glasswork, sheet metal fabrication, and metal forming.

Programming Language (0630263)

Prerequisite (216099)

Data types and constant/variable types. Types of operations. Input and output statements. Arithmetic, logical, and relational expressions. Type conversion. Control statements. Loop statements. Functions. Arrays. Pointers. Strings. Files. Structures. Introduction to object-oriented programming.

Engineering Skills (640253)

Prerequisite (116108)

Understanding the definition of engineering. Analyzing basic engineering problems. Proposing and evaluating design solutions. Communicating effectively within a team environment. Reading research papers and writing technical reports. Understanding professionalism and being aware of ethical responsibility. Understanding the basics of project management and planning for managing simple projects.

Entrepreneurship (610550)

Prerequisite 640253)

Basic Concepts of macro & micro economics, Economy architecture, production process, The effect of Science and Technology on production, The use of Science and Technology in production, Skills, Free business, Services and commodities production, Methods of project propagation, Marketing studies, Export, import and interior market consumption, Project forming, project requirements, economic appraisal studies, project financing, banking, companies, Cost studies, Project management, Marketing.

Electrical Circuits (1) (610211)

Prerequisite (216132)

Definitions and units, basic concepts(Charge ،Current, Voltage& ،Power Energy), circuit elements (independent and dependent voltage and current sources), KVL and KCL, mesh and nodal circuit analysis, network theorem, transient analysis of RL, RC, and RLC circuits ،introduction to AC circuits.

Electrical Circuits (2) (610212)

Prerequisite (610211)

Periodic waveforms, AC response of RL, RC, and RLC circuits, phasor analysis, impedance concept, resonance, steady-state analysis of AC circuits, coupled circuits, three phase-circuits, Fourier analysis, Laplace analysis, two-port networks, and circuit analysis using computers.

Electrical Circuits Lab610216

Prerequisite (610211)

DC circuits, KVL and KCL, mesh and nodal circuit analysis, network theorems, transient analysis of RL, RC, and RLC circuits, and AC circuit analysis.

Electromagnetics Fields 610313

Prerequisite (610260)

Waves & Applications- Maxwell's Equations .Electromagnetic Wave Propagation.

Power & Pointing Vectors. Reflection of a Plane Wave at normal Incidence. Transmission Lines (TL). Waveguides. Basic Antennas.

Logic circuits 610220

Prerequisite (610263)

Deals with number systems (binary, octal ،decimal, hexadecimal), Boolean variables and algebra minimization of Boolean functions, combinational circuits with MSI components, sequential circuits analysis and design, MSI counters and registers, memories, and introduction to computers.

Logic circuits lab 610222

Prerequisite (610220)

Basic logic circuits (Familiarization AND, OR, NOT, NOR, and NAND gates). De Morgan's theorems. Combinational circuits. MSI components. RS, JK, D and T. Flip-Flops. Sequential circuits. Registers and counters.

Electronics (1) 610242

Prerequisite (610211)

Semiconductor theory. PN junction. Diode circuits and applications. Bipolarjunction transistor characteristics. DC biasing and small signal analysis. Field effect transistor theory and applications.

Electronics (2) 610342

Prerequisite (610242)

Multistage Amplifier Analysis , Power Amplifiers Classes (A,B,AB,C) , Darlington Pair, Amplifier Frequency Response (Low & High Frequency Responses) , Ideal Operational Amplifier, Differential Amplifiers, Operational Amplifier as Integrated Circuits, Practical Operational Amplifier, Feedback and Oscillators

Electronics (1) Lab 610343

Prerequisite (610242)

Frequency response of EC, CB, CC, CS, and CD amplifiers, RC-coupled amplifiers, multi-stage amplifiers, differential amplifiers, operational amplifiers and oscillators.

Microprocessor 610323

Prerequisite (610220)

Introduction to microprocessor architecture. Addressing modes. Data movement instruction. Arithmetic & Logic instructions. Program control instructions. Microprocessor programming. Introduction to microprocessor interfacing.

Microprocessor Lab 610324

Prerequisite (610323)

Familiarization with the Microprocessor Lab. Microprocessor Instruction Set-and Assembly Language Fundamentals. Writing. Debugging. and Executing Various Assembly Language Programs. Memory (RAM) Interfacing. Microprocessor interfacing.

Electrical Machines (1) 610314

Prerequisite (610313)

DC generators and motors, single-phase and three-phase motors, single-phase and three-phase transformers, AC generators and machines, induction generators and motors, synchronous generators and motors, AC series motor and repulsion motor.

Electrical Machines (1) lab 610316

Prerequisite (610314)

Transformers. DC Motors and Generators. Single and Three Phase Induction Motors. Single and Three Phase Synchronous Generators and motors. AC Series Motors.

Signal and Systems 610325

Prerequisite (610260)

Continuous- Time Signals , Discrete- Time Signals, Continuous and Discrete – Time Convolution , Linear Time – Invariant Systems, System Attributes, Differential and difference equations, Fourier series , Continuous- Time Fourier Transform, Properties of Fourier Transform ،Laplace Transform, Region of Convergence, Properties of Laplace Transform.

Instrumentation and Measurements 610332

Prerequisite (610342)

Deals with measurements and errors, units and standards, analog meters, potentiometers, DC and AC bridge instruments ،transformers, electronics measuring instruments, oscilloscope, frequency and phase measurements and transducers.

Digital Electronics 610344

Prerequisite (610242)

Digital signals and systems , semiconductor diodes and transistors, logic technologies and families, Interfacing, memory elements and types , programmable logic devices, A/D converter and D/A converter, visual displays.

Power System (1) 610411

Prerequisite (610314)

System representation, per-unit power system components, generators(sequence networks, transient performance, operating limits), constants, design, insulation, steady-state and transient operational problems, crona discharge, symmetrical and asymmetrical fault analysis ،principles of power system protection, and computer applications**.**

Power System (II) (610412*)*
Prerequisite (610262+610411)

Power System Protection: Layout of Substation and Components of Power Systems. Requirements and Elements of Protection Systems. Directional and Non Directional Over-Current and Earth Fault Protection Systems. Differential Protection. Principles of Distance Protection. Load Flow: Power Flow Equations. Solutions by Gauss-Seidel and Newton-Raphson Methods. Decoupled Power Flow. Active and Reactive Power Control. Power Systems Stability: Rotor Dynamics and the Swing Equations and Power Angle Equation. Synchronizing Power Coefficients. Equal Area Criterion. Multi-Machine Stability Studies. Step-by-Step Solution of the Swing Equation. Economic Operation of the Power Systems.

Automatic Control610414

Prerequisite (610332+610260)

Introduction to feedback systems, review of system equations, block diagrams and signal flow graphs, system time response and closed loop performance, Routh's stability criterion, the root locus method ،frequency methods, compensation techniques, and introduction to sampled control systems.

Embedded Systems 610424

Prerequisite (610323)

It includes system requirements specifications, architectural and detailed design, and implementation, focusing on real-time applications. Learning the concepts will be enforced by a Project to design and develop an embedded system based on a single-chip microcontroller.

Automatic Control Lab. (610416)

Prerequisite (610414)

Open and Closed Loop System Servomechanism Principles. The Effect of Gain. Integral Control, Proportional Control. Derivative Control and Velocity Feedback on System Performance. Frequency Response Measurement.

Power System Lab. (610417)

Prerequisite (610411)

Transmission lines performance. Load characteristics. Power system protection and relays. Balanced and unbalanced faults. Stability of power systems.

Analogue Communications. (610420)

Prerequisite (610325)

Modulation Process, Continuous - Wave (CW) Modulation (AM, FM, PM), Frequency Division Multiplexing, Noise in AM and FM receivers, Sampling Theorem, Pulse Amplitude Modulation (PAM).

Power system Protection (610513)

Prerequisite (610411)

Review. Electromechanical/solid state/computer relays, over current and earth fault protection. Current and voltage transformers: Steady sate and transient performance, electronic transformers. None-pilot protection of transmission line: R-X diagram, types of distance relays, 3-phase distance relays, protection of parallel lines, effect of compensation devices. Pilot protection of transmission lines: Communication channels, direction comparison, blocking/unblocking, permissive overreaching/under-reaching trip, phase comparison relay. Pilot wire relaying. Generator protection: Stator and rotor faults overload and over-speed, loss of excitation, starting-up and motoring. Transformer protection: over-current, differential, non-electrical protection. Busbar protection: Differential relay, partial differential/percentage differential, directional comparison. Fuses: Material, mechanism of interruption of over-currents and short circuit currents, interchangeability.

Communications Lab.(610428)

Prerequisite (610420)

Signal analysis, filters, AM and FM modulators and demodulators, oscillators, amplifiers, demodulators and filter circuits, signal analysis and modulated waves, and analysis using Fourier transform.

Engineering project (1) 610440

Prerequisite (100 Cr.Hrs.)

The student must connect with one or more faculty members from the department who will assign him a project. The student will study and analyze the project and submit a proposal for its implementation in the next stage.

Reverse engineering (640458)

Prerequisite (640253)

Basic concepts in reverse engineering, History of reverse engineering, Prescreening and Preparation for the four stage Process, Evaluation verification, Technical data generation, Design verification, Project implementation, Future Applications.

Electrical Machines (II) (610514)

Prerequisite (610314)

DC machines: starting, breaking, plugging, and speed control. Three phase induction machines: starting, breaking, speed control. Single-phase induction motor: torque speed characteristics.

Communication Circuits 610526

Prerequisite (610242+610420)

Radio Frequency Amplifier. Oscillators .Modulation & AM Modulation Systems .AM Transmitter Circuit. AM Receiver Circuit. Frequency Modulations, FM transmitter Circuit, FM Receiver Circuit. PLL in Communication Application.

Power Electronics 610530

Prerequisite (610342)

Introduction to high-power semiconductor devices, AC-to-DC converters: controlled and uncontrolled single-phase and polyphaser half-wave and full-wave rectifier circuits, DC switches, AC switches, AC switches, DC to AC converters, single-phase and three-phase converters, DC on-off converters, AC frequency converters.

Introduction to Renewable Energy 611341

Prerequisite (216132)

Introduction to Renewable Energy includes terms related to renewable energy sources such as solar, wind, biomass, geothermal, hydroelectric, and marine energy, as well as basic concepts such as kinetic and potential energy, technical terms such as turbines and transformers, and environmental and economic concepts such as sustainability and carbon emissions.

Engineering project (2) 610540

Prerequisite (610440+610499)

The student implements the project identified by the department in light of the results achieved in the first phase.

Engineering Training 610499

Prerequisite (115 Cr.Hr.)

The student will spend an seven-week training period after completing 115 credit hours in the industry (inside or outside Jordan) under the supervision of a faculty member in the department. The student will be required to submit periodic reports, a final report, and take a final exam. This will be within a separate semester.

General Chemistry (1) 216141

Prerequisite (------)

This course introduces the basic theories of chemistry and covers the atomic nature of matter, stoichiometry, the periodic table, aqueous solution and concentrations, and oxidation-reduction reactions.

General Chemistry (1) lab 216143

Prerequisite (216141)

Practical chemistry typically includes titration techniques such as acid-base titration and determination of the equivalence point, preparation of laboratory materials, study of physical properties such as solubility and adsorption, analysis of samples to determine their components, and laboratory safety concepts.

Calculus (3) (250202)

Prerequisite (250102)

Complex functions - mapping, integrals in complex planes, Teller and Laurent series, singularities and residue theory, property values and property vectors.

Linear algebra and calculus (250205)

Prerequisite (250102)

Systems of linear equations, matrices, determinants, Cramer's rule, vector spaces, linear transformations, eigenvalues and eigenvectors.

Engineering Analysis (2) 610262

Prerequisite (250205)

Introduction to numerical analysis. Develop a basic understanding of numerical algorithms and skills in implementing algorithms to solve mathematical problems on a computer.

Engineering Workshop (2)

Prerequisite (620171)

Home electrical circuits, fluorescent lamp circuits, series and parallel circuits, switch installations, fuses, electronic soldering, electronic device maintenance, and circuit board design.

Engineering Analysis(1) 610260

Prerequisite (250102)

Basic Concepts and ideas, first Order Differential Equations. Second and higher order Differential Equations, Power Series Method, and Laplace Transform

Probability & Random Variables 610364

Prerequisite (610260)

Set Definition, One Random Variable, Operations on One Random Variable, Multiple Random Variables, and Operation on Multiple Random Variables, Random Process, Spectral Analysis of Random Signals, and Linear Systems with Random Signal input.

Electrical Installation 610419

Prerequisite (610411)

Types of electrical components (wires, switches, sockets, panels), design and installation of internal and external building systems, grounding and protection systems, with emphasis on occupational safety practices, faultfinding and maintenance. Select materials, carry out excavation works, install pipes and wires, connect lighting and control units, in addition to understanding inspection and prevention procedures.

High voltage Engineering (610510)

Prerequisite (610412)

H.V. measurements. Breakdown in gases. Townsend first ionization coefficient. Deionization by attachment. Mobility and diffusion. Cathode processes and secondary effects. Townsend second ionization coefficient. Streamers and kanal mechanism. Paschen's law. Partial discharges and corona. Breakdown in solid insulation. Breakdown in liquid insulation. Over-voltages characteristics of dart leaders. Over-voltages caused by dart leaders. Strokes to towers, strokes to earth wires, attraction of lighting flashes to lines, calculation of shield angle, over-voltages limitations, surge diverters, arcing horns. Expulsion tubes. External insulation. Insulators function and types. Clearance. Creepage distance and contamination. Insulation coordination: conventional and statistical methods.

Transmission & Distribution of power system (610515)

Prerequisite (610411)

Review to basic principles, relationship between utilities, consumers and regulatory authorities. Basic considerations and substation layout. Distribution transformers: Types, connections, and voltage regulation. Distribution equipment: Circuit breakers, re-closers, fuses, lightning protection. Grounding, Insulation coordination. Line construction. Basic consideration of transmission systems: System operation, stability, voltage level, HVDC, compensation. Transmission line Mechanical calculation conductors: Span, sag, tension, vibration, construction example, projects on design 132 KV OHL's and transmission systems.

Special Topics in Electrical Engineering (610516)

Prerequisite (Dept. Approval)

Up-to date subjects in Electrical Engineering.

Operation and Control In power Systems 610520

Prerequisite (610411)

The power systems operation and control approach is a set of engineering concepts and techniques aimed at regulating and directing the performance of electrical power systems to maintain stability, efficiency, and reliability. The course includes an understanding of system dynamics, the use of mathematical models and simulations, the design of control algorithms, and generation control, with an emphasis on modern strategies such as "smart grids" and "machine learning."

Reliability of Power systems 610586

Prerequisite (610411)

Applying reliability theory to electrical power systems (generation, transmission, and distribution) to improve their ability to perform assigned tasks on time and avoid breakdowns and failures. The course includes probabilistic analysis, modeling and calculations of network components, and evaluation of failure mitigation methods, such as redundancy and fault-tolerant system design, to ensure continuity of electrical service.