



# Electronics & Communication Engineering Program

## Course Descriptions

**58011101-2    Engineering Graphics    2 Credit Hours**

The course provides the undergraduate engineering student with a background in descriptive geometry, orthographic projection, engineering drawing standards and annotation, and computer-aided engineering graphics. Point line and plane relationships in projection; multi-view engineering drawings; auxiliary and section views; basic dimensioning and annotation.

**Pre-Requisites            None**

**58011001-4    General Physics (2)    3 + 1 Credit Hours**

Introduction to Electric Charge, Conductors and Insulators, Coulomb's law, Electric Field  $E$ , Electric Field of a Point Charges and Lines of Force. Basic Gauss Law, flux of a Vector Field, Flux of the Electric Field, Applications of Gauss law, Experimental Tests of Gauss law and Coulomb's law. Emphasis on Electrostatic and Gravitational Forces, Electrical Potential Energy, Electric Potential, Calculating the Field from the Potential, an Insulated Conductor. Covering topics of Capacitance, Calculating the Capacitance, Capacitors in Series and Parallel, Energy Storage in an Electric Field, Capacitor with Dielectric. Studying Electric Current, Current Density, Resistance, Resistivity, and Conductivity, Ohm's law, Ohm's law: A Microscopic View, Energy Transfers in an Electric Circuit.

**Pre-Requisites            48001300-4**

**58011201-4    Circuit Analysis (1)    3 + 1 Credit Hours**

Dissipative & storage elements, Ohm's & Kirchoff's laws, resistive circuits, dependent & independent voltage & current sources, solving dc circuits by: direct application of laws, circuit reduction, nodal & mesh analysis, superposition, Thevenin & Norton theorems, maximum power transfer. Sinusoidal waveforms, steady-state ac analysis, active and reactive power in single phase circuits, application of nodal & mesh analysis, etc., for solving ac circuits. Introduction to transient response.

**Pre-Requisites            None**



**58011002-3    Linear Algebra for Engineers    3 Credit Hours**

This course provides the students with some basic concepts in linear algebra such as matrices, Determinant and their Properties, linear equations, Solving Linear Systems, vector spaces, inner products, geometrical transformation and matrices, eigenvectors and eigenspaces.

**Pre-Requisites                    48001401-4**

**58011202-3    Introduction to Solid State Electronics    3 Credit Hours**

The course consists of an introduction to basic concepts of modern physics and the elementary quantum mechanics needed to understand basic material properties. This is followed by a discussion of band structures of materials and their implications. Finally, crystal structure, Semiconductor fundamentals, equilibrium processes in semiconductors will be covered.

**Pre-Requisites                    48001300-4, 48001401-4**

**58011003-3    Differential Equations for Engineers    3 Credit Hours**

This course gives the students the ability to solve any ordinary differential equations (ODE) with different types that connect with the engineering applications (electrical, electronic, physical). It consists of First Order Differential Equations, Linear Differential Equations of Higher Order, Differential Equations with Variable Coefficients & Laplace transform topics. Also, this course makes the students gain good knowledge about boundary and initial value problems.

**Pre-Requisites                    None**

**58011102-3    Engineering Computational Methods    3 Credit Hours**

This course is designed to introduce technical computing using the high level interactive computational tools provided by the Matlab or MathCad Environment. The intent of this course is to introduce the fundamental concepts, Solutions of Equations in One Variable, Interpolation, Numerical Differentiation, Numerical Integration, Numerical solution of ODE, Numerical solution of Partial Differentiation, Solving Non-linear Equations and computational methods relevant to different types of engineering fields using Matlab and other Mathematical Software tools.

**Pre-Requisites                    48001401-4**



**58011203-4    Circuit Analysis (2)    3 + 1 Credit Hours**

To provide students with the knowledge about the theory & analysis of electrical circuits with emphasis on transient analysis, magnetic coupling, resonance & three phase circuits. Review & applications of Laplace transform to circuit analysis, Transient response of first & second order circuits, two-port networks, resonance; definition and circuits; magnetic circuits, ideal transformer, Three-phase circuits, RLC circuits and frequency response, lossless filters, computer applications for circuits' simulation, analysis, and design.

**Pre-Requisites                    58011201-4**

**58011204-4    Electronics Devices    3 + 1 Credit Hours**

Theory and application of semiconductors, p-n junction diodes, p-n junction devices, circuit applications, theory and application of BJT, MOS capacitor and MOSFET, biasing and simple amplifier circuits. Lab experiments associated with this course provide laboratory safety concepts and application of theoretical concepts.

**Pre-Requisites                    58011202-4, 58011201-4**

**58012401-3    ELECTROMAGNETICS (1)    3 Credit Hours**

The course is comprised of topics of the electric and magnetic fields with a unified treatment of Maxwell's basic equations which enable him to understand other electric courses such as electrical machinery, power system analysis, transmission of electrical power and communication system courses. Vector analysis, static electric and magnetic fields, Coulomb, Gauss, Ampere and Faraday's Laws, Maxwell, Laplace and Poisson's equations. Solution of Laplace equation in Cartesian, cylindrical and spherical coordinates.

**Pre-Requisites                    58011004-3, 58011001-4**

**58012205-4    Electronic Circuits    3 + 1 Credit Hours**

This course covers topics of introducing voltage, power, multistage and differential amplifiers. Frequency responses of these amplifiers also will be discussed. The course then focuses on operational amplifiers theory and applications including inverting, noninverting, summing, difference and instrumentation



amplifiers, V/I and I/V converters, integrators and differentiators, comparators and Schmitt triggers. The course ends with discussing oscillators and IC timers. Lab experiments associated with this course include a mini-project to provide students with design experience.

**Pre-Requisites**                    **58011204-4**

**58012301-3    Signal Analysis                    3 Credit Hours**

This course introduces signal analysis, which is necessary for studying the different electrical, electronic, and communication courses. This course covers the analysis and processing of continuous and discrete signals, Fourier series, linear systems, impulse response, convolution, Analog filters, introduction to discrete Fourier transforms & fast Fourier transforms (DFT & FFT) and introduction to z-transformation.

**Pre-Requisites**                    **58011003-3**

**58012004-3    Probability and Statistics for Engineers                    3 Credit Hours**

This course is comprised of topics of Descriptive Statistics, basic probability concepts, discrete probability distribution, Continuous probability distribution, sampling distribution, Interference concerning means & Simple linear regression.

**Pre-Requisites**                    **58011002-3**

**58012501-2    Programming for Engineers                    2 Credit Hours**

This course consists with some basic concepts in programming for engineers using C programming language. Discussion on program structure, data types, operators, expressions, control flow, functions, arrays & pointers, input and output, structure and introduction to hardware programming.

**Pre-Requisites**                    **48001503-3**

**58012005-4    Advanced Engineering Mathematics                    3 + 1 Credit Hours**

This course provides an introduction to the complex variable functions, including analytic functions, integration, series, and residue calculus and transform methods. It provides understanding of conformal mappings, asymptotic expansions, and the study of Cauchy-Riemann problems.

**Pre-Requisites**                    **58011003-3**



**58012103-3 Introduction to Engineering Design 3 Credit Hours**

This course instils lifelong learning, creative problem solving, team work, design, and communication (written, oral, graphical, and visual) skills into engineering students. The professional engineers design their projects within certain economic, environmental, societal, and global constraints. They also consider ethics, safety, health, life cycle, manufacturability, and sustainability when designing projects. The course on “Introduction to Engineering Design” will make the students abreast with all these considerations and prepare them well for the professional skills of engineering design and communication.

**Pre-Requisites 58011002-3**

**58012302-4 Analog Communication Systems 3 + 1 Credit Hours**

This course deals with Introduction to Continuous time Signal, Review of Fourier Analysis & Analog Filtering, Amplitude Modulation, Frequency Modulation, Angle Modulation, Noise & Random Signals & Effect of noise on the performance of Analog Communication System.

**Pre-Requisites 58012205-4, 58012301-3**

**58012502-4 Logic Design 3 + 1 Credit Hours**

This course covers topics such as Introduction to Logic Circuits, Optimized Implementation of Logic Functions, Number Representation, Arithmetic Circuit, Combinational-Circuit Building Blocks, Flip-Flops, Registers, Counters & Sequential Circuits. The objective of this course is to teach the basic techniques of design process of digital systems by covering building blocks of digital logic circuits. The main emphasis is on the theoretical concepts and systematic synthesis techniques that can be applied to the design of practical digital systems using FPGAs based evaluation board.

**Pre-Requisites 58011204-4**

**58013303-3 Electromagnetics (2) 3 Credit Hours**

This course covers the topics of Mathematical tools for Electromagnetism, Maxwell Equations in vacuum, Maxwell Equations in materials, Transmission Lines – Basic Theories, Scattering parameters (S-Parameters), Optical fibers & Waveguides.

**Pre-Requisites 58012401-3**



**58013503-4      Microprocessors      3 + 1 Credit Hours**

It covers Introduction to the microprocessors, microprocessors and basic definitions, Intel microprocessors 8088/86 internal architecture, hardware, instruction set and addressing modes. Assemble Language Programming. Memory, Real time Synchronization.

**Pre-Requisites      58012502-4**

**58013304-4      Digital Communication Systems      3 + 1 Credit Hours**

This course contains the topic based on concepts in communications, probability, random Variables and stochastic processes, etc. This course emphasis on Digital Communication Systems in depth including topics such as Nyquist Sampling Theory, ADC, PCM, Delta Modulation, Line Coding & Pulse Shaping. ASK, FSK, PSK, QPSK & M-ARY PSK Digital modulation, Optimal Signal Detection, Behavior of Digital Communication Systems in the Presence of Noise, Optimum Threshold Detection, Optimum Binary Receiver, & carrier systems. It also includes introduction to Information Theory: Source Encoding, Channel Capacity of a Discrete Memoryless Channel, Shannon's Noisy Channel Theorem and Practical Communication Systems, Block coding for error detection and correction, Linear block coding, Hamming code, cyclic codes, Burst-error-detecting and -correcting codes.

**Pre-Requisites      58012302-4**

**58013402-3      Introduction to Electrical Power Engineering      3 Credit Hours**

This course is comprised of topics including Basics of electrical power system theory, Power generation, Generators, Transformers, Transmission lines & Distribution systems.

**Pre-Requisites      58011203-4**

**58013504-4      Control Systems      3 + 1 Credit Hours**

This course covers basic concepts of control systems, discussion on mathematical modeling, transfer function, block diagram, root locus analysis, control system stability, frequency response analysis and control system design.

**Pre-Requisites      58011203-4, 58012005-4**



**58013206-4      Sensors, Transducers and Measurements      3 + 1 Credit Hours**

This course consists of main working principles of various measuring instruments and techniques. Measurements of electrical variables like current, voltage, power, phase angle etc. are considered. An integrated lab provides students an understanding of sensors and transducer working and its interfacing electronics.

**Pre-Requisites      58012205-4**

**58013207-4      Digital Integrated Circuits      3 + 1 Credit Hours**

The behavior of semiconductor PN junction diodes and metal-semiconductor MN Schottky diodes, diode modelling, modes of operation, and SPICE diode model. Analysis and design of the bipolar junction transistors (BJT's) digital integrated circuits. The basic methods used to fabricate and analyze bipolar junction transistors (BJT's) in digital logic families, BJT modes of operation, parameters, and the BJT models. Silicon metal oxide semiconductor field effect transistors (MOSFET's). Analysis and design of NMOS digital integrated circuits. Analysis and design of combinational logic functions using the basic NMOS digital integrated circuits. Important features of complementary metal-oxide-semiconductor field effect transistor (CMOS) inverters, including modes of operation.

**Pre-Requisites      58012205-4**

**58014305-4      Digital Signal Processing      3 + 1 Credit Hours**

This course is to introduce the principles of modern digital signal processing, and the primary techniques for the design and implementation of various types of digital filters. This course covers discrete-time signals and systems, z-transform, frequency-analysis of discrete-times signals, frequency-domain analysis of LTI systems, the discrete Fourier transform, the fast Fourier transform, implementation of discrete-time systems, design of digital filters, quantization and round-off errors.

**Pre-Requisites      58012301-3**

**58013104-2      Engineering Standards & Professional Ethics      2 Credit Hours**

This course deals with Impact of Engineering Profession on everyday life of all people, Definition of Engineering Standards and the important types of Engineering Standards, Standard Development Organizations (SDOs), Purpose of Standards, Engineering Standards explained via Case studies,



Identification of potentially applicable standards, design and development constraints imposed by standards, Effects of standards on the purchasing decisions of customers of a product, issues related to Standardizations, Requirements of services and their relation with the commitment of professionals toward professional ethics, IEEE Code of Ethics and Mapping IEE Code of Ethics with the Islamic Values & NSPE Code of Ethics for Engineers.

<b>Pre-Requisites</b>	<b>58012103-2</b>
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