A'Sharqiyah University

College of Engineering

Department of Electrical Engineering and Computer Science

Bachelor of Engineering in Electronics and Communication Program

Course Descriptions

University Requirements (12 CH)

ISLM101 Islamic Civilization (3 CH)

This course aims to introduce students to the concept of civilization, the composition and evolution factors, introduce them to the most important political and administrative systems and economic and social development in the Islamic civilization, and aims to the statement of contributions to Islamic civilization in other civilizations, especially the European civilization, also aims to publicize the importance of the site Oman and how to interact with other previous civilizations in different eras, and the factors that allowed it to be a center of cultural divisions history.

ENGL101 English Communication Skills I (3 CH)

This course develops students' proficiency through grammar instruction and fluency exercises. While the emphasis of the class is on speaking and listening, there are also reading and writing exercises which reinforce the grammar and vocabulary students learn. Finally, students are required to participate in discussions regularly basis and give several presentations.

ENGL102 English Communication Skills II (3 CH) (Pre-R: ENGL101)

This course further develops reading sub-skills, comprehension, and vocabulary. The texts are more demanding lexically and structurally than ENGL101 and are mainly literary. Written and oral activities require students to respond to these texts critically.

MNGT313 Entrepreneurship (3 CH) (Pre-R: 60 CH)

This course is an introductory course in Entrepreneurship and Innovation. The course aims to expose students to business venturing and entrepreneurial activity. The students would apply knowledge and skills acquired during the course by developing and evaluating their business ideas. This course is an introductory entrepreneurship course that focuses on the vital role played by entrepreneurs and entrepreneurship in the 21st-century global economy. The process of successfully launching and growing an entrepreneurial venture by applying the entrepreneurial process is examined. The course integrates several different disciplines, ranging from sociology and psychology to economics, finance,

marketing, and human resource management. It is a course that mixes theory with practice by applying principles, concepts, and frameworks to real-world situations.

College Requirements (42 CH)

ENGR111 Computer Applications (3 CH)
The course teaches students how to use MATLAB and Visual Basic programming languages in a numerical computing and integrated development environment. The topics covered in the course include using variables, solving problems, data analysis functions, manipulating matrices, plotting, data presentation, logical operators, flowcharts, pseudocode, selection structures, and an introduction to Visual Basic programming language with its applications.

MATH101 Calculus I (3 CH)
The aim of this course is to lay a firm foundation for students in calculus. The course will introduce students to the concepts of limits, continuity, derivatives, hyperbolic functions and integrals. It will develop mathematic critical thinking and problem-solving skills.

PHYS101 Physics I (3 CH)
This course presents concepts and methodologies for understanding physical phenomena. Topics include kinematics, Newton's laws, work and energy, the universal law of gravitation, systems of particles, rotational motion, momentum, angular momentum, mass and energy conservation laws, thermodynamics, vibrations and waves, oscillations, and transverse waves.

CHEM101 Chemistry (3 CH)
This course presents the basic concepts and methodologies for understanding chemical phenomena. Stoichiometry of chemical reactions, quantum mechanical description of atoms, the elements and periodic table, chemical bonding, real and ideal gases, thermochemistry, introduction to thermodynamics and equilibrium, introduction to chemical kinetics, acid-base and solubility equilibria, introduction to oxidation-reduction reactions.

MATH102 Calculus 2 (3 CH) (Pre-R: MATH101)
The aim of this course is to lay a firm foundation for students in calculus. The course will introduce students to the concept's definite integrals, integration by substitution, integration by parts, sequences and series. This course also introduces students to the concepts of vector and scalar product, partial derivatives, solution of first-order ODE's and PDE's.

PHYS102 Physics 2 (3 CH) (Pre-R: PHYS101)
This course presents introduction to electricity, magnetism, electromagnetic waves, optics, and modern physics. Topics include Coulomb's Law, electric fields, Gauss' Law, electric potential, capacitance, circuits, magnetic forces and fields, Ampere's Law, induction, Maxwell's equations, electromagnetic waves, and geometrical optics.

ENGR201 Engineering Drawing (3 CH)
This course provides basic knowledge and skills of engineering drawing so that students can efficiently develop engineering plans and details. Main topics include freehand sketching, principles of

orthographic projection, dimensioning, section, isometric and working drawings, 2D and 3D drawings using AutoCAD.

ENGR202 Technical Writing and Presentation (3 CH) (Pre-R: ENGL102)
The objectives of this course are to develop engineering students' abilities to improve the communication skills and specialist language knowledge of engineers; to listen to and speak about engineering-related situations; to ask and answer important engineering-related questions; and to present engineering projects in an engaging and convincing format.

MATH215 Linear Algebra (3 CH) (Pre-R: MATH101)
The course aims to introduce students to different methods of solving systems of linear equations using matrices and to teach the representation of geometric transformations through matrices. The course covers topics such as the algebra of matrices and vector spaces, as well as applications of matrices to solutions of systems of linear equations and geometric transformations.

MATH305 Numerical Methods (3 CH) (Pre-R: MATH102 and ENGR 111)
Programming for numerical calculations, round-off error and approximation, solving nonlinear equation, solving system of linear equations, curve fitting and interpolation, numerical differentiation and integration, and solution of ordinary differential equations. Practice on the computer.

MATH204 Probability and Statistics (3 CH) (Pre-R: MATH102)
Basic concepts of descriptive statistics, statistical inference, regression, correlation analysis, hypotheses test, and confidence intervals, elements of set theory, sample space and events, probability, conditional probability and independence, examples of discrete and continuous probability distributions, multivariate probability distributions, functions of random variables, and central limit theorem.

MATH203 Differential Equations (3 CH) (Pre-R: MATH102)
Solution of first-order ODE by analytical, graphical, and numerical methods. Linear ODE's with emphasis on the second order with constant coefficients. Sinusoidal and exponential signals. Fourier series and periodic solutions. Delta functions, convolution, and Laplace Transform methods. Matrix and first-order linear systems. Classical partial differential equations of applied mathematics are covered: diffusion, Laplace/Poisson, and wave equations. Methods and tools for solving PDEs: separation of variables, Fourier series, and transforms.

MATH406 Calculus III (3 CH) (Pre-R: MATH102)
Multivariable Calculus: partial derivatives, directional derivatives, chain rules, tangent planes, maximum, and minimum, Lagrange multiplier, cylindrical and spherical coordinates, multiple integrals, and substitutions. Theorems of Green, Gauss and Stokes.

ENGR404 Engineering Economics (3 CH) (Pre-R: MATH102)
The objective of this course is to introduce the basic concepts of engineering economy and to demonstrate the importance of financial management and engineering decisions in financial project analysis. The topics covered includes an overview of financial accounting, time-value of money, risk in financial decisions, and book and tax depreciation.

ENGR322 Summer Internship (3 CH) (Pre-R: 105 CH)
This course is basically focused on practical and project based-training, research and development, communication and development skills, costing and safety awareness, exposure to data collection, troubleshooting, improvement, design and development of systems, and understanding on system operation as whole.

Program Requirements (74 CH)

ECEN 211 Digital Systems (3 CH) (Pre-R: MATH101)
The objective of this course is to equip students with the fundamental knowledge and skills required to understand, analyze and design digital circuits. Course topics are various number systems, Boolean logic, Karnaugh mapping, flip flops, counters, combinational, and sequential logic circuits for the real world.

ECEN 281 Digital Systems Lab (1 CH) (Pre-R: ECEN211)
This lab is used to introduce students the fundamentals of designing and building digital circuits using hardware Integrated Circuits (IC's). The lab includes designing and testing of various combinational circuits, sequential circuits, etc.

ECEN221 Circuits Theory I (3 CH) (Pre-R: MATH101)
This course introduces the theory and principles for DC and AC circuit analyses. This course introduces concepts of basic laws, circuit analysis techniques, operational amplifiers, capacitors and inductors, transient response of first order circuits, sinusoidal steady-state analysis**.**

ECEN341 Signals and Systems (3 CH) (Pre-R: MATH102)
This course is mainly concerned about continuous and discrete-time signals, systems, and their properties. Course topics cover convolution sum and convolution integral, system descriptions using differential and difference equations, continuous-time Fourier series, Fourier transform, and their properties, introduction to modulation and sampling, and introduction to Z-transform.

ECEN344 Renewable Energy (3 CH) (Pre-R: ECEN221)
In this course, students will receive an overview of underlying technological principles of renewable energy including solar energy, biomass, hydro, wind, wave tidal, and geothermal energy sources. Students will gain an understanding of some techniques involved in the analysis of the economics of renewable energy.

ECEN223 Communication lab 1 (1 CH) (Pre-R: ECEN342)
The main objective of this lab is to understand the fundamentals of analog communication system and to implement modulation and demodulation processes. Topics include amplitude modulation, frequency modulation, phase modulation and comparison of bandwidth and transmitted power.

ECEN331 Electronics I (3 CH) (Pre-R: ECEN221)
The goal of this course is to introduce and verify basic principles, operation and applications of analog electronic circuits and devices. Topics include concepts of electronic devices such as diodes, field effect transistors, bipolar junction transistors, design and analysis of single-stage amplifiers using FETs and BJTs.

ECEN222 Instrumentation and Measurement Techniques (3 CH) (Pre-R: ECEN221)
This course covers the basic use and application of sensors, transducers and electronic measuring instruments. Topics include concepts of generic measurements, types of indicating instruments, measurement of power and energy, RLC, magnetic measurements and non-electrical quantities.

ECEN342 Analog Communication Systems (3 CH) (Pre-R: ECEN341)
This course covers the fundamental principles underlying the analysis, design, and optimization of analog communication systems. Topics include concepts of Fourier analysis, random processes, modulation techniques including AM, AM-DSBSC, SSB, VSB and angle modulation techniques including PM and FM.

ECEN382 Electronics Lab 1 (1 CH) (Pre-R: ECEN331)
This course is a introductory experimental laboratory that explores the design, construction, and debugging of analog electronic circuits. The laboratory experiments include diode circuits, operational amplifier circuits, transistor biasing, and small signal single-stage amplifiers.

ECEN311 Optical Communications (3 CH) (Pre-R: ECEN342)
This course introduces fundamental principles and applications of fibre optic communication systems. Topics include concepts of optical fibre communications, characteristics of fibre-optic systems which has optical fibres, couplers, sources, amplifiers, modulators, and detectors.

ECEN322 Circuit Theory II (3 CH) (Pre-R: ECEN221)
This is the second of two courses that teaches the necessary tools required for basic dc, ac and transient analysis of electrical circuits. Topics includes three-phase circuits, magnetically coupled circuits, frequency response and bode plots, analysis of linear circuits using the Laplace transform, Fourier series and two-port networks.

ECEN332 Electronics II (3 CH) (Pre-R: ECEN331)
This course is a continuation of Electronics I course that discusses basic architecture and functionality of linear amplifiers. It includes topic on analysis and design of electronic circuits incorporating BJTs, FETs, ICs including differential, multistage, wideband, power amplifiers and oscillators.

ECEN481 Electronics Lab II (1 CH) (Co-R: ECEN332)
This course is to introduce the design, implementation, and measurement of amplifier characteristics. The experiments include differential amplifiers, multistage amplifiers, wideband amplifiers, power amplifiers, and oscillators.

ECEN381 Circuits Lab (1 CH) (Co-R: ECEN322)
An introductory laboratory course to the fundamentals and basic principles of DC and AC circuits. The topics include Ohm's law verification, Kirchhoff's laws, power, superposition, network theorems, Thevenin's and Norton's theorems, maximum power transfer.

ECEN316 Integrated group project (3 CH) (Pre-R: 60CH)
Students will conduct an extensive literature review and research for projects originating from faculty or the stakeholders from the industry or local communities. In this course students work on projects to

solve practical problems in electronics and communication engineering including planning, validation, and implementation.

ECEN351 Electromagnetic Theory I (3 CH) (Pre-R: ECEN221)
The course aims at introducing concepts of classical electrodynamics, especially electromagnetic waves, radiation and their applications. Topics include the basic principles of vector algebra, coordinate system and transformation, vector calculus, electrostatics, magnetostatics.

ECEN441 Digital Communication Systems (3 CH) (Pre-R: ECEN342)
This course introduces basic structures and fundamental principles of modern digital communication systems, and learn the commonly used techniques of modulation, source coding, and channel coding. Topics includes review of probability theory and random processes, noise in communication systems, baseband signalling schemes, amplitude shift keying (ASK), phase shift keying (PSK) and frequency shift keying (FSK), quadrature phase shift keying (QPSK), power spectral density, M-array modulation techniques, channel coding.

ECEN323 Communication Lab II (1 CH) (Co-R: ECEN441)
The main objective of this lab is to understand the fundamentals of digital communication system and to implement modulation and demodulation processes. The laboratory course provides hands-on exploration of line code encoder and decoder, PWM modulator and demodulator, ASK, PSK, FSK, PCM, and QAM modulation and demodulation.

ECEN312 Microcontrollers (3 CH) (Pre-R: ENGR111, ECEN211)
This course presents concepts and hands-on experience necessary to understand the architecture and software associated with microcontrollers. The topics include microcontroller architecture, block-level components, numbering systems, and the design of microcontroller-based systems for real-world industrial applications.

ECEN533 Power Electronics (3 CH) (Pre-R: ECEN322)
The course focuses on presenting the fundamentals of power electronics and applications. Topics discussed I the course include switch-mode power conversion, power supplies, inverters, motor drives, power semiconductor devices, system analysis, design, and modelling.

ECEN452 Electromagnetic Theory II (3 CH) (Pre-R: ECEN351)
The course is meant to provide a thorough coverage of advanced principles of electromagnetic theory with focus on transmission line sub-systems and high frequency data transmission. Topics includes the basic principles of electromagnetism, Maxwell's equations, wave propagation in free space and different materials, theory of transmission lines, impedance matching techniques, waveguide theory.

ECEN591 Capstone Design Project I (3 CH) (Pre-R: 90CH)
This course is a first semester of a two-semester graduation project. Students work on projects to solve practical problems in electronics and communications including planning, design, and implementation to meet specifications.

ECEN541 Digital Signal Processing (3 CH) (Pre-R: ECEN341)
In this course, fundamental of digital signal processing is introduced. The topics cover digital signal processing, sampling, z-transform, discrete and fast Fourier transforms, flowgraphs, digital filters, filter Structure, filter approximation, and their applications.

ECEN431 Communication Electronics (3 CH) (Pre-R: ECEN332, ECEN342)
The objective of this course is introduce the basic concepts of the circuits used in radio communication. The course discusses analysis and design techniques for modern communication circuits like low noise amplifiers, mixers, oscillators, phase-locked loops, and power amplifiers.

ECEN432 Communication Electronics Lab (1 CH) (Pre-R: ECEN431)
This course provides an introduction to the technologies in building communication electronic circuits. This lab course provides an analysis and design of coupler circuits, mixer, low noise amplifier, splitter, voltage-controlled oscillator, bandpass filter, and attenuator circuits.

ECEN592 Capstone Design Project II (3 CH) (Pre-R: ECEN591)
This course is a second semester of a two-semester graduation project. Students work on projects to solve practical problems in electronics and communications including planning, design, and implementation to meet specifications.

ECEN543 Wireless Communications (3 CH) (Pre-R: ECEN341)
This course aims to provide the fundamentals of wireless communications. The topics emphasis on wireless channel modelling, digital modulation in wireless channels, diversity techniques, channel coding and interleaving in fading channels, adaptive equalization, multiple access techniques, and overview of current wireless architectures.

ECEN532 Digital Electronics (3 CH) (Pre-R: ECEN332)
This course will cover transistor and circuit-level aspects of digital integrated circuit design. The course discusses topics on logic gate design at the transistor level, translation of boolean logic function into a transistor-level circuit, transistor sizing, characterization of gate delays, design and optimization of sequential systems, arithmetic circuits and delay optimization, and physical design of integrated circuits.

ECEN534 Digital Electronics Lab (1 CH) (Co-R: ECEN532)
This course covers the design and implementation of digital circuits in a modern VLSI process technology. Laboratory exercises include design and implementation of CMOS 180nm predictive technology model (PTM) Inverter, NAND, NOR, adder logic circuit as well as their functional & timing verification.

Program Electives (Choose three courses of 9 CH)

ECEN461 Control Systems (3 CH) (Pre-R: ECEN341)
The aim of the course is to provide students with a basic understanding and concepts of control systems. Topics include discussion on basic concept of control systems, mathematical modeling of physical system, characteristics of feedback control system, time domain response analysis of control system, stability analysis of linear systems, control system design.

ECEN515 Communication Networks (3 CH) (Pre-R: ECEN341)
The goal of this course is to provide a qualitative and quantitative study of the issues in the design, analysis, and operation of computer communication and telecommunication networks. The course covers illustration of the architecture of internet and the OSI - ISO reference model, design application layers' protocols such as HTTP and FTP, compare transport layer protocols (UDP and TCP) and network layer (Routing, IPV4 and IPV6), and assess the issues surrounding mobile and wireless networks.

ECEN535 CMOS Circuits Design (3 CH) (Pre-R: ECEN331)
The subject of this course is the analysis and design of CMOS integrated circuits. This course involves the topics of basic MOS device physics, single stage amplifiers, differential amplifiers, passive and active current mirrors, frequency response in amplifiers, noise, operational amplifiers, stability, and frequency compensation.

ECEN552 Antenna Theory and Design (3 CH) (Pre-R: ECEN452)
The objective of this course is to provide an in-depth understanding of modern antenna concepts, and practical antenna design for various applications. Topics includes discussion on electromagnetic waves, waveguides, concept of radiation, basic antenna parameters, dipoles and monopoles, antenna types, antenna matching techniques, and radio wave propagation.

ECEN555 Selected Topics in Communication Engineering (3 CH) (Pre-R: ECEN441)
This course introduces the innovations in the methodologies, technologies, processes, and applications in communication systems. Recent research in advanced communication systems like signal filtering, image, and audio analysis as well as a variety of networks.

ECEN556 Selected Topics in Electronics Engineering (3 CH) (Pre-R: ECEN332)
This course prepares students for engineering practice through discussion of the design of emerging electronic technologies. The course includes engineering topics and design, trends in electronic engineering including move towards miniaturization, development of compact electronic devices, such as mobile phones, wearable computers, and implantable medical devices.

EETE427 Neural Networks and Fuzzy Logic (3 CH) (Pre-R: MATH406)
The aim of this course is to impart a working knowledge of the theory and practice of artificial neural networks and fuzzy systems. The course include discussion on concepts of artificial neural networks' types, supervised and unsupervised learning, fuzzy set theory, fuzzy inference system, clustering, hybrid neuro-fuzzy system.

EETE515 Optimization Techniques in Engineering (3 CH) (Pre-R: MATH305)
The course explores a variety of optimization strategies and tools that can be used to solve engineering problems. The topics include optimization introduction, mathematical modeling, unconstrained optimization, discrete optimization, genetic algorithms, constrained optimization, robust optimization, and dynamic optimization.

EETE419 Automated Control Systems (3 CH) (Pre-R: ECEN461)
This course provides an overall exposure to the technology of Industrial Automation and Control both for discrete and continuous manufacturing. The course discusses a wide range of topics including architecture of automation systems, measurement systems, PID tuning, PLC'S and Electrical machine drives.

ECEN553 Satellite Communications (3 CH) (Pre-R: ECEN441)
This course will examine satellite telecommunication systems with an emphasis on modern systems and their link budgets. Topics will include discussion on historical perspective, current systems, orbital mechanics and constellations, choice of orbital parameters, propagation considerations, and link budgets.

ECEN554 Advanced Digital System Design (3 CH) (Pre-R: ECEN532)
The course will advance student skills in designing digital systems with programmable logic devices (PLD), such as Field Programmable Gate Arrays (FPGA). Topics covered include design process abstractions, hardware description language (HDL), methodologies and tools for automated design synthesis, implementation technologies with an emphasis on FPGAs, memories, digital system hardware architectures and programming.

ECEN551 Microwave Engineering (3 CH) (Pre-R: ECEN452)
This course uses electromagnetic principles to present the theory & operation of modern microwave communication equipment. Topics includes discussion on transmission lines, impedance matching, waveguides, resonators, scattering parameters, hybrids and couplers, microwave filters, and amplifiers.

OJTR406 Industrial Internship I (3CH) (Pre-R: 90 CH)
OJTR407 Industrial Internship II (3 CH) (Pre-R: OJTR406)

This course is an internship course in which students need to spend two semesters in the industry of related fields. This internship course provides ASU's students with the opportunity to obtain experience in a typical work environment. Students will gain exposure to various aspects of general practices along with valuable industry experiences. This process will allow students to apply the theoretical knowledge in a professional work environment. This internship course is also intended to enhance the students' skills, competences, and employment prospects.