Al-AHLIYYA AMMAN UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

COURSE DESCRIPTIONS OF
ELECTRONICS AND COMMUNICATIONS ENGINEERING PROGRAM

Number of Credit Hours: 160

Course Labeling Code:

Faculty	Code	Department Code	Year Level	Field Subject	Serial	Number

Example:

0	8	2	4	2	0	4

08 Faculty of Engineering Code
2 Department Code
4 Year Level
2 Field Subject
04 Serial Number of the Course in the Field

Course Information:

Course Name {No. of Credit Hours} [Lectures – Contact Hours]

Example:

Power Electronics {3} [3-3]

{3}: 3 Credit Hours.

[3-3]: 3 Lectures, 3 Contact Hours Per Week.

A0111101 Mathematics (1) {3} [3-3]
Functions and Models: Four ways to represent a function, Trigonometric Functions, Exponential Functions, Inverse Functions and Logarithms; Limits and Derivatives : The Limit of a Function, Continuity, Limits at Infinity, Horizontal Asymptotes, Derivatives of Polynomials and Exponential Functions, Hyperbolic Functions; Applications of Differentiations : L'Hospital's Rule and Indeterminate Forms, Maximum and Minimum Values, Optimization Problems; Integrals and Applications : The Definite and Indefinite Integrals, The Substitution Rule, Areas between Curves, Volumes, Volumes by Cylindrical Shells.
Prerequisite: None

A0111102 Mathematics (2) {3} [3-3]
Techniques of Integration: Integration by Parts, Integration, Trigonometric Integrals, Trigonometric Substitution, Integration by Partial Fractions, Strategy for Integration, Improper Integrals; Polar Coordinates and its Applications; Sequences and Series: Sequences and Series Convergence Tests, Maclaurin's and Taylor's Formulas, Applications on Sequences and Series.
Prerequisite: A0111101 Mathematics (1)

A0111201 General Physics (1) {3} [3-3]
Units Physical Quantities; Vectors; Motion in One Dimension; Motion in Two Dimensions; The Laws of Motion: Force and Interaction, Newton's laws, Mass and Weight, Friction; Energy of a System: Work, Kinetic Energy, Potential Energy, Power; Momentum Impulse and Collisions; Dynamics of Rotational Motion: Torque, static, Conditions for Equilibrium, Center of Gravity; Fluid Mechanics: Static Fluid, Dynamic Fluid; Oscillatory Motion; Wave Motion.
Prerequisite: None

A0111202 General Physics (2) {3} [3-3]
Electrostatics: Electric Charges, Coulomb's Law, Electric fields; Gauss's law; Electric potential; Capacitance and Dielectrics; DC-Circuits: Current, Resistance, Electromotive Force; Magnetostatics: Magnetic Field, Magnetic Forces; Sources of Magnetic Field; Electromagnetic Induction; Inductance; Alternating Current Circuits; Electromagnetic Waves.
Prerequisite: A0111201 General Physics (1)

A0111203 General Physics Lab. {1} [1-2]
Experimental error and data analysis; Measurements; Force Table; Motion in One and Two Dimensions; Newton's Second Law; Friction; Work and Energy; Simple Harmonic Motion: Simple Pendulum, Spring Mass system; Electricity: Ohm's Law, and Kirchhoff's Law.
Co-requisite: A0111201 General Physics (1)

A0111301 General Chemistry {3} [3-3]
Matter Classification and Properties: Elements, Atoms, Ionic and Covalent Compounds; Measurements and Dealing with Numbers; Periodic Table Chemical Calculations; Chemical Reactions in Solutions; Redox Reactions; Electronic Structure of Atoms; Basics of Chemical Bonding and Structure of Molecules; Properties of Gases, Liquid and Solid State; Intermolecular Forces; Solutions and Concentrations; Physical Properties of Solutions; Kinetics: To Study The Rates of Reactions, Acid-Base Equilibrium, pH Measurements, Thermo Chemistry and Thermodynamics, Energy and Chemical Changes.
Prerequisite: None

A0112101 Linear Algebra {3} [3–3]
Linear algebra: Matrices, Vectors, Determinants, Solution of Linear Systems of Equations, Inverse of a Matrix; Matrix Eigenvalues Problems: Eigenvalues, Eigenvectors, and Diagonalization; Complex Analysis: Complex Numbers and Functions, Analytic and Harmonic Complex Functions, Exponential, Trigonometric and Logarithmic Complex Functions.
Prerequisite: A0111102 Mathematics (2)

A0811201 Computer Skills (Engineering) {3} [3–3]
The basic concepts of programming using C++ language: C++ programming; controls structures; functions; arrays; pointers; an introduction to classes and objects.
Prerequisite: A0331700 Computer Skills (Remedial)

A0811202 Engineering Workshops {1} [1–2]
Workplace safety and use of tools; basic skills of measurements; basic skills of hand filing, welding, carpentry, sheet metal fabrication, and household electric circuits.
Prerequisite: None

A0812201 Communications Skills & Ethics {3} [3–3]
Basics of communication skills: communication process, verbal and non-verbal communication, barriers to communication; listening skills, types of listening, speaking skills: strategies for developing speaking skills, types of speaking, effective presentation strategies; reading skills: reading techniques, reading comprehension; writing skills: attributes of technical writing, benefits of technical writing, types of writing, research papers, technical reports, job application; engineering ethics: applied engineering ethics and moral principles; engineer's right's responsibilities and obligations towards society, clients and his engineering profession; engineering code of ethics.
Prerequisite: A0161201 English Language Communication Skills (1)

A0831201 Engineering Drawing {2} [2–4]
Use of instruments; lettering; drawing of basic views and projection method; orthographic; isometric drawing and sketching; sectional views; computer aided design applications using AutoCAD (2D & 3D) in all engineering aspects.
Prerequisite: None

A0832101 Differential Equations {3} [3–3]
Different methods of solving ordinary differential equations applicable to the first, second and higher-order DEs; modeling of some engineering, physical, and social problems; series solutions of ODEs; Laplace transforms; transforms of derivatives; solving ODEs by Laplace method.
Prerequisite: *A0111102 Mathematics (2) (to be passed)

A0832102 Engineering Statistics {3} [3–3]
Applications of statistics in engineering; introduction to descriptive statistics, presentation, and treatment of data; introduction to probability theory and probability distribution (discrete and continuous); counting techniques; sampling theory; statistical estimation; statistical hypothesis testing; correlation; finding regression equations and regression analysis.
Prerequisite: A0111101 Mathematics (1)

A0833101 Numerical Analysis {3} [3–3]
General numerical methods; equation solving via iteration, interpolation; numerical integration, and numerical differentiation; numerical methods in linear algebra, Gauss elimination, least squares method; numerical methods for differential equations.
Prerequisite: A0112101 Linear Algebra

A0822501 Electronics (1) {3} [3–3]
Semiconductors: conduction in materials, intrinsic and extrinsic semiconductors, semiconductor electrical properties, semiconductor propagation process, p-n diode forward and reverse biased, V/I static characteristics, temperature effects, diode's models, junction capacitance and switching time, diode types: Zener, LED and photodiode; diode applications: rectification, clipper, and clamper circuits, voltage multipliers; bipolar junction transistors: C-B, C-C, and C-E Characteristics, DC and AC analysis, BJT applications: BJT as a switch and amplifiers; field-effect transistor: V/I characteristics of JFET and MOSFET, DC and AC Analysis.

Prerequisite: A0111202 General Physics (2)

A0823101 Probability and Random Processes {3} [3–3]
Introduction to probability and random variables; statistics of random variable; random process; periodicity and stationary; variance and autocorrelation function; power spectral density; filtering of random processes; Gaussian process: noise, narrow band random process.
Prerequisite: A0832102 Engineering Statistics

A0823401 Signals and Systems {3} [3–3]
Classification of signals, basic concepts of sampling, basic continuous-time and discrete-time signals; signal processing using MATLAB; classification of systems, properties of continuous-time LTI systems, proprieties of discrete-time LTI systems, convolution processes, Laplace transform, transfer function; Fourier series; Fourier transform and applications, power spectral density, frequency response.
Prerequisite: A0111102 Mathematics (2)

A0823403 Analog Communications {3} [3–3]
Review of Fourier transforms; spectra, filters, and Hilbert transform; analog modulation techniques: AM, FM, and PM; band-pass noise representation: noise performance of analog modulation; FDM; super-heterodyne receiver.
Prerequisite: *A0823401 Signals and Systems (to be passed)

A0823404 Analog Communications Lab. {1} [1–2]
Filters; AM and FM modulation and demodulation; amplitude modulators; single-sideband transmission; super-heterodyne receiver.
Co-requisite: A0823403 Analog Communications

A0823501 Electronics (2) {3} [3–3]
Transistor biasing; single stage and multistage amplifiers; frequency response of single-stage and multi-stage transistor amplifiers; Miller effect and capacitance; high and low frequency response; differential amplifiers; operational amplifiers: linear and nonlinear operational-amplifier analysis and design; oscillators; passive and active filters.
Prerequisite: *A0822501 Electronics (1) (to be passed)

A0823502 Electronics Lab. {1} [1–2]
Diode characteristics: clipping and clamping circuits, half-wave and full-wave rectification, Zener diode, and voltage regulation; BJT characteristics and biasing circuits; FET characteristics and biasing circuits; transistor amplifiers; frequency response of single-stage and multi-stage transistor amplifiers, transfer characteristics of cascade amplifier; differential amplifier; operational amplifiers and applications; oscillators; passive and active filters.
Co-requisite: A0823501 Electronics (2)

A0823503 Digital Electronics {3} [3–3]
Digital signals and systems, pulse waveforms, switching circuits, pulse distortion, periodic pulse waveforms; switching devices, diodes and transistors as switching devices, analysis of switching circuits and switching times; logic technologies and families, digital integrated circuits terminology, DTL, RTL and TTL family, open collector, tri-state, ECL family, MOS technology, operation and types, MOS inverter, NMOS, PMOS, CMOS, dynamic MOS, CMOS transmission circuits, interfacing between families and their problems; multivibraters circuits, monostables, astables, schmitt trigger, bistables, 555 IC timer; memory elements and types, programmable logic devices; analog to digital converter and digital to analog converter.
Prerequisite: A0823501 Electronics (2)

A0823504 Digital Electronics Lab. {1} [1–2]
Characteristics of switching devices, characteristics of logic gates: RTL, TTL, and COMS; interfacing of TTL & CMOS gates and their problems; multivibrators circuit: monostables, astables, schmitt trigger, and bistables; 555 IC timer; DAC and ADC circuits.
Co-requisite: A0823503 Digital Electronics

A0824301 Fiber Optics Communications {3} [3–3]
Introduction; advantages and applications of optical communication; dielectric optical waveguides; properties of multi-mode and single-mode optical fibers: wave propagation, attenuation, and dispersion; optical sources: lasers, semiconductor laser diodes, light emitting diodes, drive circuits; optical detectors: photodiodes, PIN photodiode, Avalanche photodiode and receiver circuits, sources of noise; free space optical communication systems; optical communication systems architecture and design; numerical simulations; term project.
Prerequisite: A0824401 Digital Communications

A0824302 Wireless Communications {3} [3–3]
Fundamentals of wireless communication: the design, performance analysis, and fundamental performance limits of wireless communication systems. Overview of current and future wireless systems, wireless channel models including path loss, shadowing, and statistical multipath channel models.
Prerequisite: A0824401 Digital Communications

A0824303 Antennas and Wave Propagation {3} [3–3]
Properties of electromagnetic waves: Maxwell's equations, plane wave properties: field relationships, wave impedance, pointing vector, phase velocity, lossy media, polarization: polarization states, mathematical representation of polarization, random polarization; antenna fundamentals and principles: radiation, near-field and far-field regions, far-field radiation from wires, antenna parameters: radiation patterns, directivity, radiation resistance and efficiency, power gain, bandwidth, reciprocity, receiving antenna aperture, beamwidth and directivity, the Friis formula, polarization matching, practical dipoles: dipole structure, current distribution, radiation pattern, input impedance, antenna arrays: linear and planner arrays, the uniform linear arrays, parasitic elements (Uda-Yagi antennas), reflector antennas, monopole antennas, corner reflectors, parabolic reflector antennas, horn antennas, loop antennas, helical antennas, patch antennas; propagation of radio waves: ground waves, sky waves, troposphere propagation; microwave links.
Prerequisite: A0872501 Electromagnetic

A0824401 Digital Communications {3} [3–3]
Sampling and analog to digital conversion: PAM, PCM, DPCM, delta modulation, and TDM; principle of digital data transmission: baseband transmission, Nyquist criteria, matched filter, and noise performance; inter symbol interference (ISI) and ways to address this problem; line coding; equalization; binary band-pass transmission: BASK, BFSK, BPSK, and DPSK; geometric representation of signals: orthogonal signals, correlation receivers and signal constellations; M-ary band-pass digital transmission: ASK, PSK, FSK, and QAM; noise performance and bandwidth efficiency; synchronization.
Prerequisite: *A0823403 Analog Communications (to be passed)

A0824402 Digital Communications Lab. {1} [1–2]
Sample and hold circuit; multiplexing; sampling process and aliasing effect; generation and detection of PCM; clock recovery; digital baseband signaling (line codes and data formats): unipolar RZ, bipolar RZ, unipolar NRZ, and bipolar NRZ; error detection and correction; digital pass-band modulation techniques: ASK, FSK, PSK, and QPSK.
Co-requisite: A0824401 Digital Communications

A0824403 Digital Signal Processing {3} [3–3]
Sampling and aliasing; review of discrete time signals and systems; z-transform and its application to the analysis of LTI systems; digital signal processing (DSP) using MATLAB; discrete-time Fourier transform (DTFT); frequency response of LTI systems; discrete Fourier transform (DFT); structures for FIR and IIR filters; introduction to the design of digital filters; applications of DSP: speech processing and image processing.
Prerequisite: *A0823401 Signal and Systems (to be passed)

A0824601 Field Training {3}
Gain practical experience by working for eight consecutive weeks in an accredited institution within the Hashemite Kingdom of Jordan, or for six consecutive weeks in an accredited institution outside the Kingdom.
Prerequisite: Passing 115 CR

A0825401 Communications and Computer Networks {3} [3–3]
Circuit and packet switching; network layers; protocols: OSI, TCP/IP; access methods: telephony line modem – voice band, DSL, ISDN; wireless; fiber optic; network transmission equipment: modems multiplexers, local area networks: topologies, multiple access schemes, frame structure, capacity; Ethernet; wide area and metropolitan area networks; internet: protocols, addressing; routing, VoIP; asynchronous transmission mode: protocol layers; cell structure; physical layer, switching; synchronous transmission systems: SONET, SDH; frame relay.
Prerequisite: A0823401 Signals and Systems

A0825402 Mobile Communication Systems {3} [3–3]
Cellular system design concepts: channel planning, traffic theory, handoff, capacity; radio propagation: free space path loss model, two-ray model, practical path losses models, diversity and fading; modulation techniques; equalization; multiple access techniques: FDMA, TDMA, CDMA, OFDMA; GSM system.
Prerequisite: A0824302 Wireless Communications

A0825501 Communication Electronics {3} [3–3]
Transmitter and receiver performance; noise performance in communications electronics; noise figure; sensitivity; nonlinear behavior/performance of nonlinear devices; harmonics; blocking and desensitization; intermodulation, intermodulation distortion; one dB compression point (P1dB), third order intercept point (IP3); communication circuits at RF, PIN diodes, variable capacitance diodes, oscillators, mixers, RF power amplifiers, RF low noise amplifiers and IF amplifiers, phase locked-loop.
Prerequisite: A0824401 Digital Communications

A0825502 Optical Communication Electronics {3} [3–3]
Review of optical communications; theory of dielectric optical waveguides; physics and construction of multi-mode and single-mode optical fibers; theory of optical sources, physics and characteristics semiconductor laser diodes, light emitting diodes; optical detectors: theory and characteristics of light detectors, photodiodes types, sources of noise; power budget analysis; bandwidth budget analysis; optical integrated circuits and applications; system design; numerical simulations; term project.
Prerequisite: A0824301 Fiber Optics Communications

A0825601 Graduation Project (1) {1} [1–1]
In coordination with the department, each student (or a team of students) may choose project from a list of research projects and is/are supervised by a faculty member in the department. Graduation Project (1), which represents the first phase of the graduation project requires gathering the practical and theoretical resources needed for the completion of Graduation Project (2).
Prerequisite: Passing Field Training (*A0824601)

A0825602 Graduation Project (2) {2} [2–2]
The student implements and finalizes the work described in Graduation Project (1). After full implementation of the project's goals, the student must present a comprehensive report on the entire graduation project to an examining committee.
Prerequisite: A0825601 Graduation Project (1)

A0812101 Discrete Mathematics {3} [3–3]
Introduction to Discrete Mathematics: Logic, Relations, Functions, Basic Set Theory, Countability and Counting Arguments, Proof Techniques, Mathematical Induction, Graph Theory, Combinatorics, Discrete Probability, Recursion, Recurrence Relations, and Number Theory; The Fundamental Mathematical Tools Used in Computer Engineering as: Sets, Relations, and Functions; Propositional Logic: Predicate Logic, and Inductive Proofs, Summations, Recurrences, and Elementary Asymptotic; Counting and Discrete Probability; Undirected and Directed Graphs; Introductory Linear Algebra with Applications in Computer Engineering.
Prerequisite: A0111101 Mathematics (1)

A0812401 Digital Logic Circuits {3} [3–3]
Digital numbering system and information representation: arithmetic operations, decimal and alphanumeric codes, binary logic; boolean algebra: identities, functions and manipulation, standard forms, simplification, logic gates, switch-level and logic CMOS implementation, integrated circuits; combinational logic design: circuits (gate level), design hierarchy and procedures, computer-aided design, combinational two-level and multi-level implementations, arithmetic (add, subtract, multiply) and other popular modules (multiplexers, encoders, decoders); programmable logic design: ROMs, PLAs, PALs, FPGAs, language-directed combinational design (VHDL); sequential logic design: latches, flip-flops, state machine design and minimization (Mealy and Moore models); design problems.
Prerequisite: A0111101 Mathematics (1)

A0812402 Digital Logic Circuits Lab. {1} [1–2]
The digital logic circuits laboratory develops students with the ability of identifying the digital logic gates and combinational logic circuits such as adders, decoders. Students are also conducting experiment with memory elements (flip-flops) and sequential logic circuits.
Co-requisite: A0812401 Digital Logic Circuits

A0813201 Engineering Economy and Management {3} [3–3]
Engineering project development; decision making; basic concepts of capital investment: formulas and applications, rates of return, economic feasibility of projects (net future value, net present value, and equivalent uniform cash flow); comparison of mutually exclusive proposals; benefit-cost ratio method; depreciation; corporate taxation; resource allocation.
Prerequisite: A0111101 Mathematics (1)

A0814401 Embedded Systems {3} [3–3]
Introduction to embedded systems; introducing PIC 16 Series: architecture overview of PIC16F84A, the 16F84A memory, power up and reset; building assembly programs: introduction to assemblers, 16 series instruction set; parallel ports; PIC 16F87XA: architecture overview, special memory operations; the

physical interface; interrupts, counters and timers: working with interrupts, counters and timers, watchdog timer, sleep mode, capture mode, compare mode, PWM module; serial communication; data acquisition.
Prerequisite: A0812401 Digital Logic Circuits

A0814402 Embedded Systems Lab. {1} [1–3]
Introduction to microcontroller-based embedded systems; introduction to PIC microcontrollers; input output Ports; software generated delays; hardware generated delays (timers); interrupts; physical interface: keypads, motors, seven-segment displays, LCDs; pulse width modulation (PWM); serial communication; analog to digital converters; running the experiments includes connecting electronic circuits and writing the related programs using assembly language.
Co-requisite: A0814401 Embedded Systems

A0872301 Electric Circuits (1) {3} [3–3]
Basic components and electric circuits: units and scales, current, voltage, power, voltage and current sources, Ohm's law; voltage and current laws: Kirchhoff's voltage, Kirchhoff's current laws; nodal and mesh analysis; techniques of circuit analysis: linearity and superposition, source transformations, thevenin and norton equivalent circuits, maximum power transfer; energy storage elements: capacitor, inductor; basic RL and RC circuits: the source free RL circuit, the source free RC circuit, the unit-step function; the RLC circuit: the source free parallel circuit, the over damped parallel RLC circuit, complete response analysis; introduction to AC circuits.
Prerequisite: A0111202 General Physics (2)

A0872302 Electric Circuits (2) {3} [3–3]
Sinusoidal steady state analysis: characteristics of sinusoids, forced response to sinusoidal functions, the phasor, phasor relationships for R, L, and C, impedance, admittance; AC circuit power analysis: instantaneous power, average power, effective values of current and voltage, apparent power and power factor, complex power; three-phase circuits; magnetically coupled circuits; complex frequency and Laplace transform; circuit analysis in the s-domain; frequency response; two-port networks.
Prerequisite: *A0872301 Electric Circuits (1) (to be passed)

A0872304 Electric Circuits Lab. {1} [1–2]
DC circuits: Kirchhoff's voltage and current laws, network theorems, maximum power transfer; transient circuits: RL, RC, RLC; resonant circuits; magnetically coupled circuits; two-port networks.
Prerequisite: A0872301 Electric Circuits (1)
Co-requisite: A0872302 Electric Circuits (2)

A0872501 Electromagnetics {3} [3–3]
Basic vector algebra and vector calculus; Coordinate systems and transformation; Electric field: Coulomb's law, electrostatic field, electric potential, electric flux density, Gauss's law and boundary value problems, capacitor and energy density in electrostatic fields; Maxwell's equation; Magnetic field: steady electric current, Biot-Savart law and magneto-static fields, magnetic flux density, Ampere's law, magnetic vector potential, magnetic forces, inductance and energy density in magneto- static fields, ferromagnetic material and magnetic circuits; Time-varying fields and Maxwell's equations; Electromagnetic waves: characteristics, speed, power and polarization.
Prerequisite: *A0111202 General Physics (2) (to be passed)

A0873501 Machines and Electrical Power Systems {3} [3–3]
Analysis of AC power and review of three phase circuits; active reactive and complex power, per unit quantities, power transformers (single phase and three phase); DC machines, induction machine, synchronous machine; permanent magnet synchronous machine; introduction to electrical power systems; transmission line modeling; fault analysis (symmetrical).
Prerequisite: A0872302 Electric Circuits (2)

A0873502 Machines and Electrical Power Lab. {1} [1–2]
DC machines: motors, generators; transformers: single phase, three-phase transformers; three-phase induction motors: squirrel cage rotor, wound rotor (slip ring); single-phase motors; transmission line parameters and performance; system faults; protection systems.
Co-requisite: A0873501 Electrical Machines and Power Systems

A0874301 Power Electronics {3} [3–3]
General introduction; Power semiconductor switches: features, characteristics and classification of diodes, transistor, thyristor and others; quality assessment and parameters of AC & DC waveform; single-phase and three-Phase rectifier circuits; uncontrolled, fully-controlled, and semi-controlled converters; AC/AC converters (AC Voltage Regulators); DC/DC converters (DC choppers); DC/AC converters (inverters); applications of power electronics.
Prerequisite: A0823501 Electronics (2)

A0874302 Power Electronics Lab. {1} [1–2]
Single-Phase Half-Wave Rectifiers: Controlled, and Uncontrolled; Single-Phase Full-Wave Rectifiers: Controlled, and Uncontrolled, and Semi-Controlled; Three-Phase Half-Wave Rectifiers: Controlled, and Uncontrolled; Three-Phase Full-Wave Rectifiers: Controlled, and Uncontrolled, and Semi-Controlled; Regulators; Invertors.
Co-requisite: A0874301 Power Electronics

A0874501 Control Systems {3} [3–3]
Concept of control systems; open-loop and closed-loop systems; mathematical modeling of physical systems; transfer function and system modeling diagrams; response characteristics of control systems; specifications of system performance; stability analysis of linear control systems; Roth's stability criterion; time-domain analysis of control systems; design of controllers and compensators.
Prerequisite: A0823401 Signals and Systems

A0815201 Engineering Projects Management {3} [3–3]
Basics and importance of project management, planning and management of project specifications and scope, comprehensive planning of all necessary tasks over the life cycle of the project, planning and management of project time using critical path (PERT, CPM, GERT), planning and management of and the project budget, use of Gantt chart, stock chart method, scheduling time, expenses, and resources, managing communication between project stakeholders; project team management.
Prerequisite: A0814401 Embedded Systems

A0824404 Simulation for Electronics & Communication {3} [3–3]
In the electronic part, the course introduces computer-aided techniques for the simulation of electronic circuits. Theoretical and practical aspects of important analyses: circuit formulation methods, large-signal nonlinear DC, small-signal AC and moment matching, transient, sensitivity and noise analysis. Recent advances in timing, symbolic, and RF circuit analysis. In the communications part, the course includes review of communication systems: basic blocks and their roles on the transmit side, the basic characteristics of the channel and the basic blocks and their characteristics on the receiving side. Students should gain knowledge about the operation of each block of a typical communication system and the ability to provide

basic implementation of each of the blocks in MATLAB. In addition, the student should gain a global picture of the sequence of processing performed by each of the blocks and the ability to implement a complete communication chain for the realization of basic communication systems in MATLAB and interpret the results.
Prerequisite: A0823503 Digital Electronics

A0825301 Advanced Communication Systems {3} [3–3]
Fundamentals of color TV transmission and reception; satellite orbital mechanics, positioning of satellite with respect to earth, look angle determination (elevation and azimuth calculation), satellite link design (uplink and downlink), system noise temperature and G/T ratio, noise power budget, free path space losses, satellite parameters and configuration; analogue FM transmission, TV signals, SNR ratio for FM video transmission; baseband signals- voice and data; digital transmission system; Digital video Broadcasting.
Prerequisite: A0825401 Communications and Computer Networks

A0825302 Microwave Engineering {3} [3–3]
Introduction; review of Maxwell's equations; general concepts of transmission lines (TLs) for microwave frequencies; scattering parameter theory and microwave measurements, planar circuit technology: microstrip, stripline, coplanar waveguide, and finline; microwave devices and components: resonators, filters, power dividers, couplers, amplifiers and oscillators.
Prerequisite: A0872501 Electromagnetic

A0825403 Information Theory and Coding {3} [3–3]
Information theory; mathematical definition and properties of information; elements of probability theory; entropy and mutual information; coding and data compression; stochastic processes; channel capacity; universal coding; rate distortion theory; eigenvalue methods for data compression.
Prerequisite: A0824401 Digital Communications

A0825303 Radar Engineering {3} [3–3]
The nature of radar equation; CW and frequency; modulated radar; MTI and pulse doppler radar; tracking radar; radar transmitters and receivers; radar antennas; detection of radar signals.
Prerequisite: A0824401 Digital Communications

A0825603 Selected Topics in Communications {3} [3–3]
The objective of this course is to introduce advanced and new topics in one (or more) of the areas of communications engineering. The topics can be changed from one year to another depending on the instructor’s area of specialty and expertise.
Prerequisite: Department Council Approval

A0825604 Selected Topics in Electronics {3} [3–3]
The objective of this course is to introduce advanced and new topics in one of the areas of electronics engineering; the topics can be changed from one year to another depending on the instructor’s area of specialty.
Prerequisite: Department Council Approval

A0875603 Selected Topics in Electrical Engineering {3} [3–3]
The objective of this course is to introduce advanced and new topics in one or more of the areas of electrical engineering; the topics can be changed from one year to another depending on the instructor’s area of specialty.
Prerequisite: Department Council Approval