Details of the Study Programme

B.Sc. in Electronics & Automation Technologies

Programme Structure

Level I (30C)

Course Code	Title	No. of Hours	No. of Credits	Type
EA 1001	Waves and Vibrations & AC Theory	30L	2C	Core
EA 1002	Analogue & Digital Electronics - I	30L	2C	Core
EA 1003	Electromagnetic Theory	30L	2C	Core
EA 1004	Introduction to Computer Programming	30L	2C	Foundation
EA 1005	Computer Applications	30L	2C	Foundation
EA 1006	Computer Architecture - 1	30L	2C	Core
EA 1007	Electronic Circuit Simulations	30L	2C	Core
EA 1008	Object Oriented Programming	30L	2C	Core
EA 1009	Calculus	30L	2C	Foundation
EA 1010	Mathematical Method - I	30L	2C	Foundation
EA 1011	Differential Equations	30L	2C	Foundation
EA 1012	Probability and Statistics	30L	2C	Foundation
EA 1013	English for Science and Technology	30L	2C	Foundation
EA 1030	Analogue Electronic Laboratory	60P	2C	Core
EA 1031	Digital Electronic Laboratory	60P	2C	Core

Level II (30C)

Course Code	Title	No. of Hours	No. of Credits	Type
EA 2001	Analogue & Digital Electronics - II	30L	2C	Core
EA 2002	Analogue & Digital ICs and Data Acquisition	30L	2C	Core
EA 2003	Sensors & Transducers and Data Acquisition Systems	30L	2C	Core
EA 2004	Computer Architecture - II	30L	2C	Core

EA 2005	Applied Numerical Methods	30L	2C	Core
EA 2006	Internet Programming	30L	2C	Supplementary
EA 2007	Data Communication Techniques	30L	2C	Core
EA 2008	Rapid Applications Development	30L	2C	Core
EA 2009	Computational Statistics	30L	2C	Foundation
EA 2010	Mathematical Methods - II	30L	2C	Foundation
EA 2011	Technical Writing for Academic Purposes	15L + 30P	2C	Foundation
EA 2012	Advanced Communicative Skills	15L + 30P	2C	Supplementary
EA 2013	Industrial Management	30L	2C	Supplementary
EA 2030	Instrumentation Laboratory	60P	2C	Core
EA 2031	Data Acquisition Laboratory	60P	2C	Core

Level III (30 C)

Course Code	Title	No. of Hours	No. of Credits	Type
EA 3001	Semiconductor Devices and Optoelectronics	30L	2C	Core
EA 3002	Digital Signal Processing*	30L	2C	Core
EA 3003	Digital Image Processing*	30L	2C	Core
EA 3004	Artificial Neural Networks	30L	2C	Supplementary
EA 3005	Mobile Application Development	30L	2C	Core
EA 3006	Embedded Linux Development	15L + 30P	2C	Core
EA 3007	Computer Networking	30L	2C	Supplementary
EA 3021	Robotics	30L	2C	Core
EA 3022	Programmable Logic Controllers	30L	2C	Core
EA 3023	Medical Instrumentation	30L	2C	Core
EA 3030	Microcontroller Laboratory	60P	2C	Core
EA 3040	Research Methodologies	15L + 30P	2C	Supplementary
EA 3041	Independent Study	120P	4C	Core
EA 3050	Project	120P	4C	Core

*Optional Courses

Course Type Percentages

	Foundation (No. of Credits)	Core (No. of Credits)	Supplementary (No. of Credits)
Level I	14	16	0
Level II	6	18	6
Level III	0	24	6
Total	20	56	12
Total (%)	22%	64%	13%

Detailed Syllabus

EA 1001: Waves and Vibrations & AC Theory (30L, 2C)

Voltage and current sources, circuit elements, star-delta transformations, Thevenin's and Norton's theorems, conditions for maximum voltage and power transfer, transient response of *RC* and *RL* circuits, alternating current (AC) circuits; analysis of series and parallel *LCR* circuits using complex numbers and *S*-domain, power in AC circuits, resonance in *LCR* circuits, single phase and three phase systems, periodic motions: sinusoidal vibrations, simple harmonic motion, superposition of two vibrations with 1-D and 2-D, free vibrations, damped harmonic oscillator, forced vibrations, power absorbed by a driven oscillator, resonance, wave equation, wave speeds in specific media, phase and group velocities, impedance and energy flux, reflection and transmission; impedance matching between two media.

Assessment : Assignments and end of semester written examination.

EA 1002: Analogue & Digital Electronics- I (30L, 2C)

Analog: Junction Diode and its applications, Rectifier circuits, Zener diodes, voltage regulation, IC regulators,low voltage power supply, limiting and clamping circuits, special diode types and their applications, bipolar transistors, operation of an npn transistor, transistor biasing and transistor as an amplifier, designing of a common emitter amplifier, voltage gain, transistor as a switch, small signal equivalent circuit models, frequency characteristics of an amplifier, feedback amplifiers, Operational amplifiers, op-amp based linear circuits and their applications,

Digital: basic logic gates, designing of combinational logic circuits, minimization of logic expressions using algebraic and Karnaugh map methods, flip-flop as a

memory element, introduction to sequential logic circuits, registers, introduction to asynchronous counters.
Assessment : Assignments and end of semester written examination.

EA 1003: Electromagnetic Theory (30L, 2C)
Coulomb's law, electric field and potential, electric dipole, electric flux density, Gauss' law for electrostatics, capacitors, theory of dielectrics, boundary conditions at the interface of two dielectrics, method of images, current density and equation of continuity, Laplace and Poisson's equations, Biot-Savart law, magnetic flux density, Gauss' law for magnetostatics, Force on a current carrying wire due to a magnetic field, magnetic moment, Ampere's law, paramagnetism, diamagnetism and ferromagnetism, hysteresis and *B*-*H* curves, magnetization field, boundary conditions between different magnetic materials, electromagnets, permanent magnets, Faraday's law, self and mutual inductance, magnetic energy, Maxwell's equations, displacement current, EM-wave equation, Poynting vector, EM-wave propagation, EM-waves in conducting media.
Assessment : Assignments and end of semester written examination.

EA 1004: Introduction to Computer Programming (30L,2C)

Overview of computer programming languages, program development lifecycle, algorithm design and representation, coding and debugging, Introduction to C, programming fundamentals: identifiers, variables, constants, escape sequences, declarations; operators: scope of the operators, arithmetic, relational and logical operators, handling IO, decision control structures, repetition control structures, branching statements, Arrays: multi-dimensional arrays, pointers and structures; Functions: defining functions, global and local scope, parameters and arguments, accessing functions, static variables and functions, extern variables and functions, symbolic constants, enumerations, inline functions, recursive functions.
Assessment : Assignments and end of semester written examination.

EA 1005: Computer Applications (30L,2C)
History and introduction to computers, operating systems (Windows & Linux), word processing applications: basic editing and text formatting: fonts, margins, alignment, and indentation; types of views, context manipulation: find, search and replace, spell checker; objects embedding, headers & footers, styles, mail merge, save and backup options, page setup, margins and printing; spreadsheet applications: common user interface components, basic editing, data entry, move, copy, and cut and paste functions, insertion, deletion and modifications at

sheet/workbook level, formulas. built-in spreadsheet functions, addressing and referencing schemes, graphs and charts, different views and printing, presentation applications, graphic design and Image editing applications, introduction to internet and email, Web design applications.

Assessment : Assignments and end of semester written examination.

EA 1006: Computer Architecture- I (30L,2C)

Numbers and systems: data representation, character codes, number representation, ASCII, Unicode, compliments, fixed and floating point representation, binary arithmetic, Boolean algebra, architecture of a microcomputer (Von Neumann), memory (RAM, 1-D/2-D memory chips, ROM, PROM, EPROMS, PLA, Dynamic RAM). microprocessors: processing models (Turing, Von Neumann, embedded systems, microcontrollers, analogue, DSP). architecture: CPU, accumulator, registers, stack, memory, data multiplexing. instruction set overview: arithmetic, logical, jumps, moves, decimal adjust..

Assessment : Assignments and end of semester written examination.

EA 1007: Electronic Circuit Simulations (30L,2C)

Introduction circuit simulation software and Pspice engine, schematic capturing, bias point analysis, DC sweeps, transient and the time domain analysis, AC circuit analysis, Fourier analysis & harmonic components.

Assessment : Assignments and end of semester written examination.

EA 1008: Object Oriented Programming (30L,2C)

structured, procedural and object oriented programming; introduction to JAVA: byte code, virtual machines, Javadoc, packages, arrays; OOP concepts: encapsulation, classes and objects, constructors, class members: data members & methods and their visibility: private, public, or protected; class hierarchies, single and multiple inheritance, interfaces, class variables and instance variables, memory management and garbage collection; polymorphism, overloading, type conversions; exception handling, threads, streams and formatted I/O, file handling, namespaces, String objects, standard template library; fundamental data structure; sorting and searching algorithms.

Assessment : Assignments and end of semester written examination.

EA 1009: Calculus (30L,2C)

Review of differentiation and integration; applications of the derivative: linear approximation, graphs, ellipses, parabolas and hyperbolas, the mean value theorem; integrals: antiderivatives, properties of the integral, the fundamental theorem, numerical integration; exponentials and logarithms: growth and decay, hyperbolic functions; techniques of integration: integration by parts, trigonometric integrals, trigonometric substitutions, partial fractions, applications of the integral: areas and volumes, integrating circuits etc; polar coordinates and complex numbers; infinite series: the geometric series, the Taylor series, power series; partial derivatives: surface and level curves, tangent planes and linear approximations, maxima, minima, and saddle points; differential equations.

Assessment : Assignments and end of semester written examination.

EA 1010: Mathematical Methods – I (30L, 2C)

Matrices; notation, scalars, column vectors and row vectors, matrix operations, square matrices, random walk, system of linear equations, derivative and integral of a matrix, properties of matrices, special square matrices, eelementary operations; reduced and reduced echelon form, solution of system of homogeneous and non homogeneous equations. vectors: definition and elementary approach, scalar and dot product, cross product, triple scalar and vector product, gradient, divergence, curl, successive application of gradient. vector integration; line, surface and volume integration. theorems; Gauss's theorem, Stokes theorem, Green's theorem, potential theorem, Helmholtz theorem.

Assessment : Assignments and end of semester written examination.

EA 1011: Differential Equations (30 L, 2C)

Ordinary differential equations with examples: particular solution, general solution, singular solution, complete primitive; remark on existence of solution; first order first degree equation; singular points. introduction of the differential. special types of ODE's of the first order - separable ODE's, exact equations, integrating factor, Bernoulli's, Riccati-type equations. orthogonal trajectories; linear equations of the first order; linear equations of the second order with constant coefficients; complementary function, particular integral; Euler's homogeneous form of the second order, partial differential equations, variable separable method, Fourier series.

Assessment : Assignments and end of semester written examination.

EA 1012: Probability and Statistics (30 L, 2C)

Descriptive statistics: types of data; scales of measurement, data summarization, measures of location; measures of dispersion, probability: counting rules, permutations and combinations, finite sample space, events, probability rules, conditional probability, independence, multiplication rule, Bayes' theorem, one dimensional random variables; probability density function and probability (mass) function, cum. distribution function, expected value, variance, associated theorems, and moment generating function, distribution of functions of random variables. discrete distributions: Uniform, Bernoulli, binomial, Poisson, and applications; continuous distributions: uniform, exponential, normal; central limit theorem.

Assessment : Assignments and end of semester written examination.

EA 1013: English for Science and Technology (30 L, 2 C)

Basic grammar structures, adjectives, adverbs, pronouns, prepositions; English for academic purposes (EAP) based writing (simple paragraphs and essays); Reading strategies (skimming and scanning), EAP based reading (texts taken from scientific journals, text books and internet); Simple listening exercises, EAP based listening (lectures and note taking); Expressing opinions, giving a talk.

Assessment : Assignments and end of semester written examination.

EA 1030: Analogue Electronics Laboratory (60 P, 2C)

Experiments based on diodes, transistors, voltage and current regulation, operational amplifiers and related applications. At the completion of the course, the student will be able to demonstrate skills of designing and using of analogue electronic circuits and develop skills of writing technical reports based on analysis of experimental data.

Assessment : Continuous assessment.

EA 1031: Digital Electronics Laboratory (60 P, 2C)

Experiments related to AND, OR, NAND, NOR, EX-OR, EX-NOR Logic gates, combinational logic circuits, adders, flip-flops, counters, registers etc. At the end of the course, the student will be able to demonstrate the handling of electronic components and related equipment of basic digital electronics and develop skills of writing technical reports based on analysis of experimental data.

Assessment : Continuous assessment.

EA 2001: Analogue & Digital Electronics- II (30L, 2C)

Analog: The 741 op amp and its constituent building blocks, small signal analysis of the input and the output stages of 741, Further applications of op-amps, electronic ammeters and voltmeters, instrumentation amplifier, op amp circuits with positive feedback, applications of 555, oscillators and waveform generators; D/A and A/D converters.
Digital: Physical characteristics of Logic families: TTL, CMOS, interfacing CMOS and TTL; combinational logic: encoders and decoders, multiplexers and demultiplexers, digital arithmetic (adders, subtractors and multipliers), synchronous circuits: counters, shift registers, static memory, state machines.
Assessment : Assignments and end of semester written examination.

EA 2002: Analogue & Digital ICs and their Applications (30L, 2C)
Analog: General features and handling of IC packages; applications in analogue electronics: amplifiers, drivers, interfaces, frequency control, optoelectronics & displays, power supply & control, signal generation, conditioning & conversion, analogue switching.
Digital: Memory ICs: ROM, SRAM, DRAM; timers and counters; Programmable logic devices: PAL, PLA, CPLD, FPGA; Bus interfacing: three state devices, open collector outputs, one-wire and two-wire (I2C) interfacing, RS232.
Assessment : Assignments and end of semester written examination.

EA 2003: Sensors & Transducers and Data Acquisition Systems (30L,2C)
Types of sensors: pressure, force, position, temperature, flow, velocity and volume; piezoelectric; Hall effect; optical; chemical sensors and bio-sensors; applications in chemical, agricultural and medical industries, environmental monitoring, and industrial safety. elements of a data acquisition system; signal conversion techniques; A/D and D/A converters, sampling concepts; reconstruction of signals, aliasing, discrete-time processing of continuous-time signals, device interfacing; signal conditioning; noise sources, spectral density and circuit calculations, signal to noise ratio, interference control and selectivity, computer controlled electronics; filtering and averaging, isolation, input, output and timing characteristics, data transfer and interrupts, pulse signal processing, signal transmission, impedance matching, pulse distortion and shaping, instrumentation for pulse signal processing, Instrumentation techniques, timing methods, coincidence techniques, triggers.
Assessment : Assignments and end of semester written examination.

EA 2004: Computer Architecture- II (30L,2C)

Instruction set design: assembly and machine language, microprogramming, firmware, RISC and CISC; addressing modes: register, direct, indirect, indexed; pipelining: instruction and arithmetic pipelines, structural hazards and data dependencies, branch delay and multicycle instructions; memory hierarchy: cache memory, virtual memory; peripherals: memory-mapped I/O devices, port-mapped I/O devices; bus signals and interfacing; typical programmable I/O chips; bus systems: RS232, IEEE488, internal bus systems; multiprocessors: SISD, SIMD, and MIMD architectures, centralized and distributed shared memory- architectures.

Assessment : Assignments and end of semester written examination.

EA 2005: Applied Numerical Methods (30L, 2C)

Computational errors; random number generators, flow control, computer errors, error propagation, avoiding large errors, nested computing for computational efficiency, interpolation and curve fitting; interpolation by polynomials, two-dimensional interpolation, curve fitting, numerical differentiation; difference approximations for derivatives, interpolating polynomial and numerical differential, numerical integration; numerical integration and quadrature, double integral, ordinary differential equations; Euler's method, Runge–Kutta method, predictor–corrector method, high-order differential equation to state equation, boundary value problem, shooting method, optimization; unconstrained optimization, golden search method, constrained optimization, unconstrained optimization, linear programming.

Assessment : Assignments and end of semester written examination.

EA 2006: Internet Programming (30L, 2C)

Introduction to the Internet: web servers browsers, IP addresses, DNS and URL, client server model, W3C; Web page design with HTML and CSS: characteristics of good web design, designing for the Web vs. designing for print, introduction to style sheets, inheritance and specificity in CSS, Web development IDEs, basic text styling with CSS, typography on the Web; applying typographical principles with CSS, Color and contrast on the Web; preparing images for the Web; applying background images with CSS, CSS box model; floating and positioning elements with CSS, grids and grid theory; page layouts with CSS, Styling links with CSS pseudo classes; client side programming in Java Script: basics, objects, forms, cookies; server side programming with PHP: object oriented and structured concepts of PHP, processing forms with PHP, sessions, database connectivity, handling graphics; Ajax, XML, Java Script and PHP frameworks and content management systems

Assessment : Assignments and end of semester written examination.

EA 2007: Data Communication Techniques (30L. 2 C)

Data communication concepts; pulse and digital modulation; pulse code modulation (PCM), coding, signaling (Baud) rate, bandwidth considerations, power in digital signals, PCM system analysis, error detection, data errors and error control, serial transmission and interfacing, carrier systems and modems, synchronous communication techniques, ISDN, OSI model, Ethernet, TCPIP, fibre-optics communication systems. analogue to digital conversion; linear and non-linear systems, signal superposition and decomposition, convolution and impulse response; correlation; discrete Fourier transform and its applications; fast Fourier transform, continuous signal processing; digital filters–recursive filters, Chebyshev filters etc.; applications in audio processing and data compression.

Assessment : Assignments and end of semester written examination.

EA 2008: Rapid Applications Development (RAD) (30L, 2C)

RAD concept and introduction to programming task: RAD phases, comparison between RAD and traditional methodologies, Introduction to the latest tools available;

introduction to a RAD environment: dialog boxes, SDI, MDI applications, component development: reusability, introduction to COM, DCOM, DLLs, Active X and other technologies; database design and modeling tools: DAO, RDO, ADO technologies, client/server architecture, data service, business service, presentation service, reverse-engineering, round trip engineering, multitasking, Internet integration and network communication: building web enable applications, client /server debugging.

Assessment : Assignments and end of semester written examination.

EA 2009: Computational Statistics (30L, 2C)

Probability concepts; conditional probability and independence, common distributions, sampling concepts; concepts, sampling distributions, parameter estimation, empirical distribution function, generating random variables; general techniques, continuous random variables, discrete random variables, exploratory data analysis; exploring univariate data, exploring multi-dimensional data, Monte Carlo methods for inferential statistics; classical inferential statistics, Monte Carlo methods for inferential statistics, bootstrap methods, data partitioning; cross-validation, jackknife, probability density estimation; histograms, kernel density estimation, finite mixtures, generating random variables, statistical pattern recognition; Bayes decision theory, evaluating the classifier, classification trees, clustering, nonparametric regression; smoothing, kernel methods, regression trees.

Assessment : Assignments and end of semester written examination.

EA 2010: Mathematical Methods – II (30L, 2C)

Laplace transforms; basic properties, inversion problem, convolution theorem, primitive function theorem, applications. Fourier series; spectrum analysis, parity properties, Fourier cosine and sine series, applications, differentiation and integration, Fourier analysis, Fourier cosine and sine transforms, basic theorems, Fourier analysis of transient waveforms, applications, convolution theorem, auto and cross correlation, linear response functions, transfer functions, Fraunhoffer diffraction, diffraction from a grating, Z-transforms; derivation of the z-transform, relationship between the Laplace, Fourier, and the z-transforms, Region of Convergence(RoC), Properties of the z-transform; time shifting, frequency modulation, differentiation in the Z-domain, two-sided Z-transform, transfer function, poles and zeros, the response of a single and second order poles, inverse Z-transform.

Assessment : Assignments and end of semester written examination.

EA 2011: Technical Writing for Academic Purposes (15L, 30P, 2 C)

Analysis of the language of academic writing; familiarization with the accepted criteria of lab reports and dissertations; introduction of various standards of scientific writing (reports, research papers, journal articles and abstracts).

Assessment : Continuous assessment.

EA 2012 Advanced Communicative Skills (15L, 30P, 2C)

Analysis of the language of academic presentations and interviews; giving academic presentations, and facing interviews.

Assessment : Continuous assessment.

EA 2013: Industrial Management (30L, 2C)

Introduction to accounting and depreciation: accruals, prepayments and preparation of financial statement and performance evaluation; Introduction to cost accounting: budgeting, break-even analysis, marginal and absorption; Introduction to marketing management and primary concepts: Break-even, pricing decision, stock valuation, costing methods and overhead allocation; Introduction to human resource management and key result areas: Fundamental practices of operations management, and evaluation of basic level operational solution; Business law; Introduction to labour and business related legal framework

Assessment : Assignments and end of semester written examination.

EA 2030: Instrumentation Laboratory (60P, 2C)

Laboratory exercises for designing, building and testing of circuits to perform various tasks including data acquisition and controlling. The exercises will be of semi open-ended type. The students may be given circuit diagrams, but will be expected to design some parts or modify them to suit the applications concerned. They will then be expected to construct the circuits, test them and produce a finished product complete with enclosures and user manuals.

Assessment : Continuous assessment.

EA 2031 Data Acquisition Laboratory (60P, 2C)

Experiments covering topics that include applications of various analog ICs, ADC and DAC circuits, applications of various Digital IC's, designing programmable logic devices (SPLD, CLPD and FPGA) and use of various sensors and transducers.

Assessment : Continuous assessment.

EA 3001: Semiconductor Devices and Opto-Electronics (30L, 2 C)

Semiconductors: Intrinsic and extrinsic, charge carriers, Fermi level, transport phenomena: drift and diffusion, carrier generation and recombination, *p*-*n* Junction: equilibrium, biased *p*-*n* junction, ideal current-voltage relationship, non-uniformly doped junctions, solar cells, the tunnel diode, metal-semiconductor: Schottky barrier, metal-semiconductor Ohmic contacts, bipolar junction transistor: transistor action, low-frequency common base current gain, equivalent circuit

model, fundamentals of the MOSFET: basic operation, frequency limitations, MOS technology, JFET: concepts & device characteristics, frequency limitations, optoelectronics: semiconductor hetero-structures, optical absorption, emission and refraction, LED, optical detectors, optical modulators, semiconductor lasers.

Assessment : Assignments and end of semester written examination.

EA 3002: Digital Signal Processing (30L, 2C)

Time domain and frequency domain; introduction to analog filters; analog to digital conversion: quantization, sampling theorem, anti-aliasing Filters; linear time invariant systems: requirements for linearity, superposition, common decomposition methods; convolution: delta function, impulse response, convolution, implementation of convolution in software; Impulse responses to common inputs; The discrete Fourier transform, Fourier transform properties, digital filters: moving average filters, windowed-sinc filters etc.;

Assessment : Assignments and end of semester written examination.

EA 3003: Digital Image Processing (30L, 2C)

Introduction to image processing and multispectral imaging, intensity transformations and spatial filtering, processing in the frequency domain, image restoration, geometric transformations and image registration, color image processing, wavelets, image compression, morphological image processing, image segmentation, representation and description, object recognition.

Assessment : Assignments and end of semester written examination.

EA 3004: Artificial Neural Networks (30L, 2C)

From spikes to rates, perceptrons: simple and multilayer, perceptrons as models of vision, linear networks, hybrid analog-digital computation, ring network, constraint satisfaction, birectional perception, signal reconstruction problem, Hamiltonian dynamics midterm, antisymmetric networks, excitatory-inhibitory networks, learning, associative memory, models of delay activity, integrators problem set, multistability clustering, PCA, delta rule, backpropagation, stochastic gradient descent, reinforcement learning.

Assessment : Assignments and end of semester written examination.

EA 3005: Mobile Application Development (15L, 30P, 2 C)

Introduction to mobile computing: types of devices, mobile operating systems, types of applications; mobile phone technologies; types of mobile apps: user interfaces, data storage, networking, specialized instruments (accelerometers, GPS,

etc.); introduction to Android: application architecture, Android SDK, review of Java; application development: activities and tasks , resources, assets, and intents, data storage; Android virtual device emulator.

Assessment : Continuous assessment.

EA 3006: Embedded Linux Development (15L, 30P, 2C)

Introduction to Linux: file system, kernel internals, kernel compilation, port communication, networking; device drivers: kernel and loadable device drivers, device driver development; embedded systems: C libraries. building a cross-compiling toolchain, bootloaders. Cross-compiling and booting a Linux kernel, file systems: BusyBox based root file system, block file systems, manipulating flash partitions; cross-compiling libraries and applications, embedded system building tools, developing and debugging applications for the embedded system.

Assessment : Continuous assessment.

EA 3007: Computer Networking (30P, 2C)

An Introduction to networking, networking standards and the OSI model, transmission basics and networking media, topologies and Ethernet standards, network hardware, client-server communication models in LAN, addressing, routing, TCP/IP suite, structure and operation of the domain name system used in TCP/IP suite, WANs and remote connectivity, wireless networking, network operating systems, voice and video over IP, network security, troubleshooting network problems, ensuring integrity and availability, network management.

Assessment : Continuous assessment.

EA 3021: Robotics (30L, 2C)

Introduction: History, robot architectures, technical concepts of robotics; power systems; robot locomotion: legs and wheels, motor drives, steering methods; Actuators: DC gear motors, stepper motors, servo motors, motor controllers, PWM techniques, relays,; sensors: pressure sensing, object detection, proximity sensors, light detection, robot vision etc.; control systems: PIC/AVR/ARM microcontrollers, timer/counters, programming techniques, ADC/DAC, GPIO, communication ports; robot navigation: wall following, line following, odometry.

Assessment : Assignments and end of semester written examination.

EA 3022: Programmable Logic Controllers (30L, 2C)

Introduction to PLCs: RLCs vs. PLCs, PLC selection criteria, I/O modules, expansion modules, popular PLC modules; I/O modules: discrete input module, AC input

module, DC input module, sinking & sourcing, sensor input, special input modules, Sensors: limit switch, reed switch, photoelectric sensors, inductive proximity sensors, TTL output, Relay output, Isolated output, surge suppression in output, open collector output, I/O addressing schemes; programming: relays and logic functions, comparator, programming devices, programming methods: STL and CSF, FBD and Ladder methods, simple instructions, NC and NO contacts, latch and unlatch outputs, pulse edge evaluation, on-delay and off-delay timers, counters, timer/counter applications, program control instructions, data manipulating instructions, math instructions, converting relay ladder diagram into PLC relay ladder diagram, PID and PWM functions, PLC implementations for star-delta starter

Assessment : Assignments and end of semester written examination.

EA 3023: Medical Instrumentation (30L, 2C)

Electrocardiography, electromyography, electroencephalogrphy, X-ray imaging, film screen radiography, mammography, digital radiography, fluoroscopy, computed tomography, gamma camera, single photon emission tomography (SPECT), positron emission tomography (PET), ultrasound imaging, magnetic resonance imaging.

Assessment : Assignments and end of semester written examination.

EA 3030: Microcontroller Laboratory (60P, 2C)

Basics of microprocessors, Von Neumann and Harvard architectures; assembly language and machine language; 6809 and 8088 architectures; PIC/AVR Microcontroller: overview, structure and hardware concepts, OP codes, hardware programming tools, software programming, low level and high level languages; Programming built in hardware: ADC, DAC, timers, counters, capture, compare and pwm modules, USART, interrupts, eerpom, flash memory, Interfacing external peripherals: LEDs, SSDs, LCDs, servo and stepper motors, GPS modules, GPRS/GSM modules, camera modules, gyroscopes and accelerometers, proximity sensors, humidity and temperature sensors, key pads.

Assessment : Continuous assessment.

EA 3040: Research Methodologies (15L, 30P, 2C)

This course allows students to gain experience and acquire the general research skills essential in academic and industrial environments. Classroom discussions and assignments will be used for analyzing topics such as types of research, selection of research topics, definition and formulation of problems, assessing current status with literature surveys, use of the Internet in research work, hypothesis building, research design, quantitative and qualitative methods, data interpretation and research ethics.

Assessment : Continuous assessment.

EA 3041: Independent Study (120P, 4C)

This course focuses on improving the self-learning and presentation skills of students. Students are guided by a senior member of the academic staff to study a specific topic and present their work at a seminar.

Assessment : Continuous assessment based on written assignments and presentations.

EA 3050: Project (120P, 4C)

Individual or group of students will be assigned a project of one-year duration. The project may be research oriented or a development of devices, techniques, software etc related to electronics. A dissertation submitted on the project will be examined at a seminar presentation**.**

Assessment : Dissertation and oral presentation.

(Note: In all theory courses, in which the assessments are based on assignments and end of semester written examination, the lecturer in charge may decide to allocate up to 40% of the total marks for the assignments.)

Programme Delivery and Learner Support System and Assessment Procedure

Qualifications Awarding Criteria

Degree of Bachelor of Science (External) in Electronics and Automation Technologies:

(a) Completion of a minimum of ninety (90) credits with at least thirty (30) credits from each of Level I, Level II and Level III.

and

(b) Obtaining a grade not lower than C in course units aggregating to at least sixty (60) credits, including at least 10 credits from each of Level I, Level II and Level III,

and

(c) Obtaining a minimum overall GPA of 2.0.

Diploma in Electronics and Automation Technologies:

(a) Completion of a minimum of thirty (30) credits defined by the Board of Study,

and

(b) Obtaining a grade not lower than C in course units aggregating to a total of 20 credits specified by the Board of Study,

and

(c) Obtaining an overall GPA of 2.0 or above.

Advanced Diploma in Electronics and Automation Technologies:

(a) Completion of a minimum of sixty (60) credits defined by the Board of Study,

and

(b) Obtaining a grade not lower than C in course units aggregating to a total of 40 credits specified by the Board of Study,

and

(c) Obtaining an overall GPA of 2.0 or above.

Level I – Certificate in Electronics and Automation Technologies:

(a) Completion of a minimum of thirty (30) credits in Level I,

and

(b) Obtaining a grade not lower than C in course units aggregating to at least twenty (20) credits in Level I,

and

(c) Obtaining an overall GPA of 2.0 or above in Level I.

Level II – Certificate in Electronics and Automation Technologies:

(a) Completion of a minimum of sixty (60) credits with at least 30 credits from each of Level I and Level II,

and

(b) Obtaining a grade not lower than C in course units aggregating to at least forty (40) credits, including a minimum of ten (10) credits from Level I and twenty (20) from Level II,

and

(c) Obtaining an overall GPA of 2.0 or above in Level II.