Plan of Study: Diploma in Electrical and Computer Engineering

Year I		
Fall Semester		**15 Credits**
Code	**Course Title**	**Credit Hours**
CMPS 100B	Introduction to Technical Computing for the Sciences	3
ENGL 101	Basic Academic English I	3
MATH 199	Calculus I	3
PHYS 170	Fundamentals of Physics I	3
PHYS 170L	Introductory Physics Laboratory I	1
ENGR 105	Engineering Graphics	2
Spring Semester		**17 Credits**
Code	**Course Title**	**Credit Hours**
EECE 130	Computers and Programming I	3
EECE 130L	Computers and Programming Laboratory	1
EECE 210	Electric Circuits I	3
ENGL 102E	English for Engineering and Sciences I	3
ENGR 100	Introduction to Engineering	3
MATH 200	Calculus II	3
ENGR 110	Engineering Workshop	1
Summer Semester		**9 Credits**
Code	**Course Title**	**Credit Hours**
ENGL 203E	English for Engineering and Sciences II	3
MATH 205	Calculus III	3
SOCS 102	Omani Society	3

Year II		
Fall Semester		**17 Credits**
Code	**Course Title**	**Credit Hours**
EECE 211	Electric Circuits II	3
EECE 210L	Electric Circuits Laboratory I	1
EECE 220	Digital Systems Design	3
EECE 230	Computers and Programming II	3
MECH 272	Mechanical Statics	3
PHYS 210	Fundamentals of Physics II	3
EECE 211L	Electric Circuits Laboratory II	1
Spring Semester		**17 Credits**
Code	**Course Title**	**Credit Hours**
EECE 212	Basic Electronics	3
EECE 212L	Basic Electronics Laboratory	1
EECE 220L	Digital Systems Laboratory	1
EECE 221	Microprocessor Systems	3
EECE 231	Data Structures and Algorithms	3
MATH 210	Differential Equations	3
ENTR 200	Entrepreneurship: Innovation and Creativity	3
Summer Semester		**0 Credits**
Code	**Course Title**	**Credit Hours**
EECE 299	Practical training for Diploma Students	0

Courses Description

EECE 130 Computers and Programming I (3 crs)

This course covers the fundamental concepts of programming using C++ as a high level language, basic programming tools, input and output functions, variable declaration, mathematical and logical operations, programming control structures, program composition of functions, scope of identifiers, principles and basic operations of arrays. Prerequisite: CMPS 100B.

EECE 130L Computers and Programming Laboratory (1 crs)

This course covers the basic programming concepts with particular application to the solution of engineering problems using a high level programming language namely C++: fundamental concepts of C++, solving mathematical functions, control structures, functions, and arrays. Co-requisite: EECE 130.

EECE 210 Electric Circuits I (3 crs)

This course covers the fundamentals of DC electric circuit: quantities such as current, voltage and power; active and passive elements; laws of DC circuit analysis; analyzing simple resistive circuits using DC circuit analysis standard techniques; and introduction to AC circuits. Prerequisite: PHYS 170.

EECE 210L Electric Circuits Laboratory I (1 crs)

This course deals with the experiments on DC circuits using modern experiment modules, measurement and display devices. The experiments include the practical realization, simulation, testing, and analysis of electric circuits: verification of basic circuit laws, series and parallel circuits, network analysis, analysis of DC circuits using MULTISIM. Co-requisite: EECE 210.

EECE 211 Electric Circuits II (3 crs)

This course deals with the experiments on DC circuits using modern experiment modules, measurement and display devices. The experiments include the practical realization, simulation, testing, and analysis of electric circuits: verification of basic circuit laws, series and parallel circuits, network analysis, analysis of DC circuits using MULTISIM. Co-requisite: EECE 210.

EECE 211L Electric Circuits Laboratory II (1 crs)

This course deals with wide range of experiments on DC circuits and AC circuits using modern experiment modules, measurement and display devices. The experiments include the practical realization, simulation, testing, and analysis of electric circuits: series and parallel circuits, network analysis, response of R, RL and RC circuits in frequency domain and circuit analysis using MULTISIM.
Co-requisite: EECE 211.

EECE 212 Basic Electronics (3 crs)

This course covers the fundamentals of basic electronics: Introduction to semiconductors, PN-junctions, Diode circuits, models and applications: rectifiers, comparators, voltage limiters, clippers, clampers and power dissipation. LEDs, Zener diode regulator, BJT and MOSFET characteristics and applications. Operational amplifiers. Prerequisite: EECE 210.

EECE 212L Basic Electronics Laboratory (1 crs)

This course covers the characteristics and application of electronic devices: study of the characteristics of diodes, and BJTs, some applications of diodes such as rectifiers, voltage regulators, and characteristics as well as applications of OP-AMPS. The experiments are performed using modern experiment modules, measurement and display devices. MULTISIM is used for simulation and analysis of electronic circuits. Co-requisite: EECE 212.

EECE 220 Digital Systems Design (3 crs)

This course covers principles of digital systems design: Number systems and codes, combinational circuit analysis, synthesis and practices; minimization methods, sequential logic design principles, latches and flip-flops, synchronous circuits, state machines, and an introduction to VHDL. Prerequisite: EECE 210.

EECE 220L Digital Systems Laboratory (1 crs)

This course covers the experiments on logic gates, flip-flops, ALU, and timers: verification of logic gates and flip-flops, design of encoders and decoders, adders, comparators, code converters, counters and shift registers. Experiments are to include hardware realization and implementation using modern experiment modules, simulation of circuits using MULTISIM software. Co-requisite: EECE 220.

EECE 221 Microprocessor Systems (3 crs)

This course covers an introduction to microprocessor systems; memory types, busses, and programming model; assembly language programming; addressing modes; assemblers. Translating high-level programs to assembly language; arithmetic operations, logic operations, selection statements, looping, pointers, subroutines, macros, etc. Interfacing techniques; interfacing ICs. Prerequisite: EECE 220.

EECE 221L Microprocessor Laboratory (1 crs)

This course covers realization of engineering application using assembly language programming on microprocessor/microcontroller kits: hands-on design experience with micro-computer systems and applications including busses, interfaces, usage of ports and registers, realization of control of DC motor and stepper motor, traffic signal control and washing machine controller. Co-requisite: EECE 221.

EECE 230 Computers and Programming II (3 crs)

This course covers advanced programming concepts with particular application to the solution of engineering problems using C++ programming language: strings, pointers, structures, object-oriented programming, classes, objects, constructors, destructors, inheritance and an introduction to data structures and algorithms. Prerequisite: EECE 130 and EECE 130L.

EECE 231 Data Structures and Algorithms (3 crs)

This course covers algorithm design and programming techniques in large programs: recursion, sorting and searching algorithms, different data structures (stacks, queues, lists, trees, binary search trees) are described as abstract data types with their methods by training extensive examples and applications. Prerequisite: EECE 230.

EECE 299 Diploma Practical Training (0 crs)

This is a supervised project/internship course aimed at providing practical experience for Electrical and Computer Engineering diploma students. Prerequisite: Permission of the advisor.

EECE 320 Computer Organization and Architecture (3 crs)

This course covers and introduction to computer systems, CISC and RISC, performance of computer systems, the MIPS microprocessor architecture, ISA design principles, instruction mapping into registers, hardware floating point arithmetic, data path design, control unit design, pipelining, memory, I/O. Prerequisite: EECE 221. Annually.

EECE 330 Software Engineering (3 crs)

This course covers the fundamentals of software engineering to create practical and cost-effective solutions to software systems including: understanding system requirements, effective methods of design, coding, testing, evaluation and maintenance. Prerequisite: EECE 231. Annually.

EECE 330L Object Oriented Technologies Laboratory (1 crs)

This course covers Object oriented technologies using Java programming language: requirements analysis and system design using UML; documentation; debugging; testing; use of software development tools; graphical user interface; concurrent programming; database connectivity; web and networking applications and web services. Prerequisite: EECE 230.

EECE 340 Signals and Systems (3 crs)

This course covers the main concepts of signals and systems: definition, classification and examples of signals and systems, signals properties and operations, systems properties and interconnection; convolution theorem; La place transform and inverse Laplace transform of system examples; and Fourier series representation of signals. Prerequisites: EECE 210 and MATH 335. Annually.

EECE 341 Electromagnetic Field Theory I (3 crs)

This course covers the concepts of electrostatics and magneto statics fields theory: vector analysis. static electric

fields, Coulomb's law, Gauss's law and applications, capacitance, electrostatic forces, Poisson's equation, static magnetic fields, Biot-Savart law, Ampere's law, Faraday's law, vector magnetic potential, inductance, and magnetic energy. Prerequisites: MATH 335 and PHYS 210 Annually.

EECE 342 Communication Systems (3 crs)

This course covers baseband and pass band transmission techniques includes: continuous-wave modulation; pulse modulation (PAM, PWM, PPM), PCM, differential PCM, delta modulation, baseband data transmission and digital modulation techniques, ISI, Nyquist theorem, eye pattern, signal-space analysis, ASK, FSK, PSK, DPSK and M-ary modulation. Prerequisite: EECE 340.

EECE 342L Communication Systems Laboratory (1 crs)

This course covers various experiments related to analog and digital communication techniques: modulation and demodulation techniques such as AM and FM, PAM, PCM, and PWM; multiplexing and de-multiplexing, ASK, PSK, and FSK, and Signal broadcasting, some MATLAB based programming and modeling are introduced. Co-requisite: EECE 342. Annually.

EECE 344 Electromagnetic Field Theory II (3 crs)

This course covers advances topics in electromagnetic field theory: Maxwell's equation for time varying electromagnetic fields; Faraday's Law; stationary loop in a time-varying magnetic field; moving conductor in a stationary magnetic field; plane wave propagation, time-harmonic fields, and propagation in lossless media; transmission lines and antennas. Prerequisite: EECE 341. Annually.

EECE 350 Fundamentals of Electric Power Engineering (3 crs)

This course comprises the fundamentals of electric power engineering: an overview of electric power network; magnetic materials, basic laws and properties such as hysteresis loop and saturation; single-phase transformer, circuit analysis, modeling, efficiency and parameters calculation using open and short-circuit tests; induction motor; and synchronous generators. Prerequisite: EECE 211. Annually.

EECE 360 Control Systems (3 crs)

This course includes the fundamentals of control systems engineering: definition, configuration and design of open loop and closed loop systems; mathematical modeling of dynamic control systems such as electric circuits; block diagrams, transfer functions; stability analysis; transient response and steady state error calculations of first and second order systems; and root locus. Prerequisite: EECE 340. Annually.

EECE 361 Power Systems I (3 crs)

This course introduces the main features of electrical power systems: configuration; modeling of transmission lines; design procedure and parameters calculation of power feeders; per-unit system calculations; introduction to symmetrical components; Prerequisite: EECE 211. Annually.

EECE 361L Power Systems Simulation Laboratory (1 crs)

This course presents the MATLAB programming environment: introduction to linear algebra and operations on matrices; MATLAB commands; m-files; and MATLAB applications such as series expansions of trigonometric functions, solving simultaneous equations, plotting graphs, and simulation of electric circuits using SIMULINK toolbox. Prerequisite: EECE 211. Annually.

EECE 370L Web Programming Laboratory (1 crs)

This course covers fundamental technologies and techniques for creating applications on the world wide web (www) from client and server sides: introduction to the internet and web, HTMl, XHTML, CSS, JavaScript and PHP programming languages Prerequisite: EECE 130.

EECE 400 Practical Training (0 crs)

This is a supervised project/internship course aimed at providing practical experience for Electrical and Computer Engineering BS students. Prerequisite: Permission of the advisor.

EECE 401 Final Year Project I (0 crs)

A supervised project, normally in groups of three students, aimed at providing practical experience in some aspects

of computer, communications, and electrical engineering. Students are expected to complete a literature survey, project specification, critical analysis, and to acquire the necessary material needed for their intended end product. Annually.

EECE 402 Final Year Project II (3 crs)

A course that seeks to impart in students the skill to integrate the knowledge gained in different courses by asking them to deliver a product that has passed through the design, analysis, testing, and evaluation stages. This course includes production of a professional report, design process and outcome, implementation and testing, verification and validation, and critical appraisal of the project. Prerequisite: EECE 401. Annually.

EECE 410 Advanced Computer Architecture (3 crs)

This course covers evolution of advanced computer architectures; classification of parallel processing systems; a study of scalable and parallel computer architectures for achieving a proportional increase in performance with increasing system resources; cutting-edge technologies in scalable parallel computing are presented with emphasis on design aspects. Prerequisite: EECE 320. Alternate years.

EECE 411 Computer Systems Analysis (3 crs)

This course covers the development of analytical models of computer systems and application of such models to performance evaluation. Topics covered include scheduling policies, paging algorithms, multi-programmed resource management, and queuing theory. Prerequisite: EECE 320. Alternate years.

EECE 412 Computer Graphics (3 crs)

This course covers fundamentals of computer graphics: interactive graphics, vector generation and point-plotting displays, graphical input devices, windowing, clipping, viewports, zooming, geometrical transformations (2D and 3D), advanced display architecture, Raster algorithms, Raster display architecture, representation of 3D shapes and applications: CAD, menu-driven packages, and simulation. Prerequisite: EECE 320. Alternate years.

EECE 413 Embedded System Design (3 crs)

This course covers the design of embedded systems: embedded hardware design, system design process, embedded computing platforms, software design tools and technologies, CAD tools, compilers, and assemblers; hardware design tools and technologies, hardware-description languages, high-level synthesis tools, ASIC and FPGA design flows; memory; interfacing. Prerequisite: EECE 221.

EECE 413L Embedded System Design Laboratory (1 crs)

This course covers embedded hardware design. Main topics includes: embedded computing platforms, software design tools and technologies: CAD tools, compilers, and assemblers; hardware design tools and technologies: (VHDL and/or Verilog), high-level synthesis tools (Handel-C), ASIC and FPGA design flows; memory; interfacing; Pre– or co-requisite: EECE 413 or Permission of the Instructor.

EECE 414 Fault Tolerant Computing (3 crs)

This course covers the concepts and terminologies of fault-tolerant system design; reliability of series/parallel systems; redundancy management, voting, information redundancy, MTTF, M-of-N systems, reliability block diagrams, systems diagnosis; software fault tolerance, fault tolerant networks, common network topologies, fault tolerant routing. Prerequisite: EECE 220. Annually.

EECE 421L Computer Interfacing Laboratory (1 crs)

This course covers realization of engineering application by interfacing hardware with C++ programming language: debug environment, using parallel ports, I/O operation, realization of control of LEDs, seven segment displays and simple motor control through parallel ports. Introduction to VHDL. Co-requisites: EECE 130, EECE 220.

EECE 422 Information Theory and Coding (3 crs)

This course covers and introduction to information theory, entropy and mutual information; discrete memory-less sources, discrete memory-less channels and their capacity-cost functions; concepts of source coding, lossy and lossless compression techniques; concepts of channel coding and error control, linear codes, convolutional codes, and Turbo codes. Prerequisite: MATH 335. Annually.

EECE 422L Information Theory and Coding Laboratory (1 crs)
This course covers encoding and decoding of linear block codes; convolution codes: generator polynomial, state diagram, Trellis diagram, Viterbi decoding algorithm, turbo codes: effect of change of frame size, iterations, code rate, MAP and SOVA decoding algorithms. Co-requisite: EECE 422. Annually.

EECE 424 Data Communication Networks (3 crs)
This course covers data communication networks: network topology; data transmission fundamentals; error control; multi-layer network architecture and protocols; network management; network security and privacy; network performance measurements. Prerequisite: EECE 470. Alternate years.

EECE 430 Design and Applications of Information Systems (3 crs)
This course covers fundamentals of design and applications of information systems: investigating hardware and software selection criteria; case studies; application software maintenance; resource allocation; scheduling; staffing requirements; processing organizations; applications. Prerequisite: EECE 330. Annually.

EECE 432 Distributed Object-Oriented Systems (3 crs)
This course covers the subject of distributed object-oriented systems: middleware for distributed objects; dynamic object requests; distributed objects life cycle, persistence, transactions, and security. Prerequisite: EECE 330. Alternate years.

EECE 433 Database Management Systems (3 crs)
This course covers the fundamentals of data base technology: introduction to data base management systems, relational DB, relational model, relational algebra, SQL query languages, DB design and the E-R model and application design and development. Prerequisite: EECE 230. Alternate years.

EECE 437 Optimizing Compilers (3 crs)
This course covers the area of optimizing compilers: characteristics of building modern optimizing compilers including intermediate representations, basic blocks and flow graphs, data flow analysis, partial evaluation and redundancy elimination, loop optimizations, register allocation, instruction scheduling, and inter-procedural analysis. Prerequisites: EECE 231 and EECE 320. Alternate years.

EECE 439 Object-Oriented Systems (3 crs)
This course covers the object oriented technology used for building software systems: languages, databases, analysis and designs, and systems: software lifecycles, layered architectures, object reusability, and multi-developer support. Prerequisite: EECE 330. Alternate years.

EECE 440 Fiber Optics (3 crs)
This course covers fiber optics: generation and propagation of light, interaction of light and matter, geometric optics, ray tracing and aberration theory, superposition of waves, coherence and interference, and Fresnel and Fraunhofer diffraction; special topics: lasers and holography. Prerequisite: EECE 341. Annually.

EECE 443 Microwave Communication Systems (3 crs)
This course covers microwave communication systems: transmission principles and media including lines, radio links, optical fibers; antennas: L.F., H.F., earth stations, and satellites; design and performance of microwave links; satellite communications; cellular networks. Prerequisite: EECE 342. Annually.

EECE 444 Environmental Impacts of Energy Systems (3 crs)
This course covers the environmental impacts of energy systems: world energy resources and classifications; sources and effects of air pollution; air quality modeling, Gaussian dispersion models; motor vehicles emissions and noise pollution, mitigation strategies; environmental impacts of electricity generation, pollution control systems, electromagnetic radiations. Prerequisite: ENGR100. Annually.

EECE 450 Artificial Intelligence (3 crs)
This course covers the fundamentals of artificial intelligence: search techniques, knowledge representation, logic and theorem proving; expert systems; natural language understanding, vision; learning from experience and prolog. Prerequisite: EECE 231. Alternate years.

EECE 452 Neural Networks (3 crs)

This course covers back propagation, and adaptive neural networks; transformation by layered networks, statistical neurodynamics, associative memory and neural learning; applications to functional approximations, signal filtering, and pattern classification. Prerequisite: EECE 231. Alternate years.

EECE 460 Digital Control (3 crs)

This course covers the analysis and design of digital control systems: z-transform techniques; state-space representation; single-input-single-output linear time invariant discrete and continuous systems; controllability, observability; and controllers. Prerequisite: EECE 360. Annually.

EECE 460L Control Systems Laboratory (1 crs)

This laboratory comprises the analysis of linear continuous control systems: first and second order systems; transient and steady-state system responses; and the effect of system poles and zeros location on the overall system performance and stability. Co-requisite: EECE 360.

EECE 461 Instrumentation (3 crs)

This course covers instrumentation systems, including measurements, sensors, data acquisition, and component integration. Application areas and course projects include industrial control, lab measurements, and automation systems. Prerequisite: EECE 221. Annually.

EECE 462 Power Electronics (3 crs)

Power Diode, Power Bipolar Junction Transistor (BJT), Thyristor, Power MOSFET and IBGT, Single phase Rectifiers, Three-phase Rectifiers, Inverters, DC-to-DC Switching Converters (Choppers), Voltage Regulators, Application of Power Electronic Device in Power Networks such as Flexible AC Transmission Systems (FACTS) and High Voltage Direct Current (HVDC) Technologies. Prerequisite: EECE 212, Annually.

EECE 463 Power Systems II (3 crs)

This course is considered as an advanced course in electrical power systems which comprises the short-circuit analysis of electric power networks; three phase symmetrical and asymmetrical fault calculations; formation of Y-Bus and Z-Bus; load flow; and power flow calculations using numerical iterative techniques. Pre requisite: EECE 361. Annually.

EECE 470 Computer Networks (3 crs)

This course covers networking concepts and technologies, networking architectures and protocols, internetworking and applications, data communications; wide area networks; circuit and packet switching; routing; congestion control; local area networks. Prerequisite: MATH 335. Co-requisite: EECE 342. Annually.