EEX3262 Introduction to Object Oriented Programming

Level	3
Course Code	EEX3262
Course Title	Introduction to Object Oriented Programming
Credit value	2
Core/Optional	Optional(Computer, Electrical, Electronics and Communication)
Course Aim/s	To write Programs in Java by applying object oriented concepts with appropriate error handling and code refactoring techniques for a given scenario.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Explain the impact of object oriented paradigm over major Programming paradigms, object oriented principles and how object oriented Programming evolved. CLO2: Apply code refactoring techniques and naming standards to refine the source code in written Programs. CLO3: Develop solutions for a given set of problems in Java using appropriate object oriented concepts and exception handling techniques.
Content	**Outline Syllabus:** Unit 1: Introduction to Object Oriented Programming 　　　Session 1: Overview of Object Oriented Programming 　　　Session 2: Java Programming Environment 　　　Session 3: Data Types and Variables in Java 　　　Session 4: Conditional and Recursions 　　　Session 5: Objects and Classes 　　　Session 6: Attributes, Methods and Constructors Unit 2: Object Oriented Concepts 　　　Session 7: Encapsulation 　　　Session 8: Inheritance 　　　Session 9: Polymorphism 　　　Session 10: Refactoring, Abstraction and Reusability Mechanisms 　　　Session 11: Errors, Exceptions handling and Debugging **Laboratory Work:** 1. Write simple java Programmes to get familiar with Java control structures, class and method declarations, and refactoring techniques. 2. Write simple java Programmes to get familiar with access specifiers, constructor, initializing an object, instantiation of an object, message passing and mutator methods 3. Write simple java Programmes to illustrate more examples with message passing, inheritance ,overriding and overloading 4. Write a console java Programme to solve a given problem by applying object oriented concepts to achieve code reuse

EEX3331 Electrical measurements and instrumentation

Level	3
Course Code	EEX3331
Course Title	Electrical measurements and instrumentation
Credit value	3
Core/Optional	Core (Computer, Electrical, Electronic and communications)
Course Aim/s	Aim of this course is to gain proficiency in measurement of electrical quantities and design systems to measure non-electrical physical quantities
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Interpret experimental results with measuring standards, SI units and appropriate statistical methods. CLO2: Describe basic principles and techniques of electrical measuring instrumentation. CLO3: Perform experiments to measure electrical quantities in a laboratory. CLO4: Discuss the functions of advanced testing instruments in an electrical laboratory. CLO5: Design electrical measuring systems with basic techniques and software tools to measure physical quantities.

Content	**Outline Syllabus:**
	
	Unit 1: Basic concepts of measurements
	    Session 1: Development of SI units and measuring standards
	    Session 2: Statistics for experiments and reporting results
	    Session 3: Precision, Accuracy and Sensitivity - Interpretation of Errors
	    Session 4: Calibration of meters.
	    Session 5: Moving coil meters - measurement of voltage and current
	    Session 6: Bridge circuits and null methods
	    Session 7: Potentiometer
	    Session 8: Internal properties of meters - Loading effect
	Unit 2: Measurement of electrical properties
	    Session 9: Measurements of an electrical waveform - RMS, Average, Peak, Period
	    Session 10: Measurement of high voltage and current - CT and PT
	    Session 11: Measurement of high, medium and low resistance
	    Session 12: Measurement of Capacitance - De Sauty's, Schering Bridges
	    Session 13: Measurement of Inductance - Owen, Anderson, Carey Foster Bridges
	    Session 14: Measurement of Frequency - Wein Bridge
	    Session 15: Measurement of Earth Resistance
	    Session 16: Magnetic measurements
	    Session 17: Sensitivity analysis and shielding of bridge circuits
	Unit 3: Instrumentation
	    Session 18: Oscilloscope (CRO and DSO)
	    Session 19: Multimeter (Analog and Digital)
	    Session 20: Wattmeter, Energy meter and Power Factor meter
	    Session 21: LCR meter
	    Session 22: Insulation tester and contact resistance tester
	    Session 23: Advanced Laboratory Instruments - Spectrum Analyzer, Impedance/Material Analyzer
	    Session 24: Measurement of physical properties – Sensors
	    Session 25: Design of Electrical measuring systems
	    Session 26: Software based measurements

Content	

	Laboratory work :
	
	1.
	    a. Measurement of active power, reactive power, power factor and energy of an AC circuit using Wattmeter, universal Wattmeter, power factor meter and Watt-hour meter
	    b. Measurement of power of three phase systems using two wattmeter and three wattmeter methods
	2.
	    a. Measurement of insulation resistance using insulation tester
	    b. Measurement of capacitance, inductance and loss factor of a material using AC bridge circuits
	    c. Measurement of contact resistance using Kelvin double bridge and contact resistance tester
	    d. Design of electrical measuring systems to measure a non-electrical quantity

EEX3336 Communications and Computer Technology

Level	3
Course Code	EEX3336
Course Title	Communications and Computer Technology
Credit value	3
Core/Optional	Core (Computer, Electrical, Electronic & communication)
Course Aim/s	To provide knowledge on fundamentals of computer technology, networking and communication.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to CLO1: Describe the evolution of microprocessors and computer models, and their applications to solve real-world problems. CLO2: Describe basic components of a microprocessor and their operations with reference to different Instruction Set Architectures (ISAs), and peripherals used in computers. CLO3: Build a personal computer connected to a network using basic components and peripherals. CLO4: Write a simple Programme using a given ISA and simulate its operation in fetch-execute cycle. CLO5: Perform simple arithmetic calculations in different number systems for a given problem. CLO6: Describe the fundamentals of computer networking, Internet and Internet services, and how OSI reference model is applicable in a computer network. CLO7: Explain security threats and preventive & recovery measures in computers and computer networks. CLO8: Identify components commonly used in wired and wireless communication systems. CLO9: Perform basic calculations related to analog and digital modulation techniques and power in communication systems.
content	**Outline Syllabus:**

Unit 1: Computer Technology
    Session 1: Evolution of microprocessors and computer models
    Session 2: Arithmetic in computers: whole numbers
    Session 3: Arithmetic in computers: fractions
    Session 4: Where these arithmetic operations are done in a computer
    Session 5: Components connected to a microprocessor
    Session 6: How operations are done in a microprocessor
    Session 7: How to use machine instructions to solve problems
    Session 8: What you finally get
Unit 2: Computer Communications
    Session 9: Introduction to networking
    Session 10: Connecting devices and network topologies in LAN, MAN and WAN
    Session 11: The Internet, World Wide Web and network Security
    Session 12: Introduction to wired and wireless communications
    Session 13: Modulation techniques in communication systems
    Session 14: Power calculations in communication systems

Laboratory work:

1. a) Identify the basic components and peripherals of a personal computer and their functions.
   b) Perform assembling of a personal computer, installing operating system.
2. Study the fetch-execute cycle for a given assembly Programme.
3. Implement a simple network and get it connected to a LAN and hence to the internet.
4. Verify the functions at transmitter and receiver ends using amplitude modulation.

EEX3351 Electronics I

Level	3
Course Code	EEX3351
Course Title	Electronics I
Credit value	3
Core/Optional	Core (Computer/Electrical/Electronics)
Course Aim/s	To introduce the fundamentals of designing electronic circuits.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Describe the behavior of basic semiconductor devices, diodes and transistors. CLO2: Interpret the common applications of the basic semiconductor devices, diodes and transistors. CLO3: Apply AC circuit modeling techniques in transistor amplifier circuits. CLO4: Describe the operation of operational amplifiers and their common applications. CLO5: Design basic combinational logic circuits using Karnaugh maps based simplification. CLO6: Interpret common sequential logic circuits. CLO7: Construct digital combinational logic circuits for implementing the real world simple logic systems.

Content	**Outline Syllabus:**
	
	Unit 1: Semiconductor devices- Review
	    Session 1: The PN junction diode
	    Session 2: Special purpose diodes
	    Session 3: Bi-polar junction transistors
	    Session 4: Field effect transistors.
	Unit 2: Diode applications
	    Session 5: Introduction to power supplies, rectifiers, clippers, clampers
	    Session 6: L-C-R circuits, Filters/smoothers, regulators.
	    Session 7: Transistor amplifier: Biasing and configurations, Stability of transistor amplifiers/Q point, DC & AC load lines.
	Unit 3: Small signal transistor amplifier
	    Session 8: Small signal h-parameter modeling
	    Session 9: Transistor amplifier modeling
	    Session 10: Transistor amplifier circuit analysis
	Unit 4: Operational Amplifiers
	    Session 11: Introduction/Fundamentals of operational amplifiers
	    Session 12: Op-amp applications: Comparators, differentiators and integrators, summers, Schmitt Trigger, waveform generators.
	Unit 5: Digital Electronics
	    Session 13: Number systems
	    Session 14: Binary arithmetic
	    Session 15: Boolean algebra, logic gates
	    Session 16: Basic combinational logic design (Truth table, Minterms and Max terms, Karnaugh map)
	    Session 17: Sequential logic: Multivibrators, Flip-flops
	    Session 18: Introduction to sequential circuits (Mealy & Moore)

Content	Laboratory Sessions:
	1. Observe the transistor input-output characteristics. 2. Observe the operation common emitter amplifier operation. 3. Observe the operation of a transistor as a switch. 4. Design the applications of an operational amplifier. 5. Observe the operation of a bi-stable multivibrator. 6. Design circuits using NAND gates for some logic functions, and their operations.

EEX3410 Introduction to Electrical Engineering

Level	3
Course Code	EEX3410
Course Title	Introduction to Electrical Engineering
Credit value	4
Core/Optional	Core
Course Aim/s	Aim of this course is to provide basic principles of Electrical Engineering and its applications
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Perform analysis of simple capacitor circuits computing electrostatic interactions. CLO2: Describe basic circuit theories of electricity by using first order passive circuits. CLO3: Analyse DC and AC circuits using the basic circuit theories. CLO4: Analyse linear magnetic and electro-magnetic circuits using basic magnetic circuit theories. CLO5: Describe the operating principles of electrical machines using electro-magnetic principles. CLO6: Describe generation and transmission of electric energy and the safe & efficient use in the household. CLO7: Describe characteristics of ideal and real semiconductor diodes and its applications. CLO8: Describe the use of basic transistor circuits for amplification and switching. CLO9: Perform laboratory experiments accurately and safely using appropriate measuring instruments

Content	**Outline Syllabus:**
	
	Unit 1: Electrostatics
	    Session 01:Introduction to Electrostatics
	    Session 02:Electric Flux & Electric Potential
	    Session 03:Capacitors
	Unit 2: DC Circuits
	    Session 04:Voltage-Current relationship in DC circuits
	    Session 05:Kirchhoff's Laws
	    Session 06:Circuit Theories
	Unit 3: Electromagnetism
	    Session 07:Introduction to Magnetism
	    Session 08:Magnetic Flux
	    Session 09:Effects of Magnetic Flux
	    Session 10:Magnetic circuits

Session 11:Electromagnetic Induction
Session 12:Transients in DC circuits
Unit 4: AC Circuits
    Session 13:Fundamentals of Waveforms
    Session 14:Voltage-Current relationship in AC circuits
    Session 15:RLC circuit calculations
    Session 16:Power in AC circuits
Unit 5: Electrical Machines
    Session 17:Basics of Rotating Machines
    Session 18:Transformers
Unit 6: Electrical Measurements
    Session 19:Principles of Measuring Instruments
    Session 20:Operating Measuring Instruments
Unit 7: Electrical Power Generation & Transmission
    Session 21:Generation of Electrical Power
    Session 22:Transport of Electric Energy
Unit 8: 3-phase Systems
    Session 23:Introduction to Three-phase Systems
    Session 24:Three-phase Power
Unit 9: Electrical Installations
    Session 25:Electrical Safety
    Session 26:Domestic Wiring
Unit 10: Electronics
    Session 27:Semiconductor Diode
    Session 28:Diode circuits
    Session 29:Transistors
    Session 30:Transistor applications

Laboratory work:

Three experiments are conducted during 6 sessions – 3 days
1. Verification of Kirchhoff law for DC circuits
2. Measure the fundamental characteristics of AC signals using oscilloscope
Verification of characteristics of non-linear components

EEX4330 Communications

Level	4
Course Code	EEX4330
Course Title	Communications
Credit value	3
Core/Optional	Core (Electronics)
Course Aim/s	To provide a fundamental knowledge on telecommunication systems and their applications.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to CLO1: Describe the historical development path, the current & future trends and regulatory aspects of telecommunication systems. CLO2: Describe the basic operations employed in telecommunication namely digitization, modulation and multiplexing. CLO3: Demonstrate the development of switching and signalling sub systems along with the telecommunication system evolution. CLO4: Apply the principles of electromagnetic wave propagation in unguided transmission media and antennas. CLO5: Evaluate various types of transmission networks based on their architecture, performance and applications. CLO6: Use radio and TV broadcasting principles to describe the operation and standards of analog and digital broadcasting systems
Content (Main topics, sub topics)	**Outline Syllabus:** Session 1: Introduction to telecommunication systems and networks Historical development, Need of regulatory aspects, Global organizations, TRC, Basic block diagram of Telecommunication system. transmitter, receiver, channel – basic description; access network, Backbone network, transmission, MPLS, IMS, NGN etc Session 2: Current and future trends in telecommunication ITU and its Contribution, IoT, SDN, Diversity and Interference Mitigation Strategies, Spectrum Re-use Strategies, salient features of 5G, visible light communication Session 3: Advantages and disadvantages of digital communication, Sampling – selection of a suitable sampling frequency, Nyquist sampling theorem, quantizing, encoding linear quantizing, nonlinear quantizing (a-law, ulaw) ,PCM Concept Session 4: Multiplexing and standard multiplexing hierarchies TDM, FDM,E1, Multi-frame E1, E1 data rate, PDH, SDH(STM), WDM Session 5: Switching principles Session 6: Signalling Session 7: Advanced analog and digital modulation techniques Suppressed carrier and single sideband AM, Vestigial sideband AM , PSK, QAM, detection techniques Session 8: Electromagnetic waves and propagation Basics of Electromagnetic Waves, Un-guided transmission media Session 9: Antenna types and design characteristics Session 10: Optical transmission techniques Fiber optic media, principle of operation, Types of optical fiber, System components, Advance optical Communication techniques, SONET, NG/SDH/SONET, OTN, Optical amplifiers, Optical fiber characteristics and specifications, Industrial best practices and standards Session 11: Satellite communication systems Geostationary Satellite, Satellite Communication System, Different Frequency Bands used in Satellite Communication

Session 12: Cellular concept and multiple access
Introduction, channel reuse, interference, cell planning, minimum interference distance calculation, cell types, multiple access, cellular network generations, cell capacity

Session 13: Cellular network architectures and Operational principles
Cellular Network Components and their Functions , AMPS, GSM, CDMA, 4G and 5G
Architecture & Operation, New Trends

Session 14: Handoffs, roaming and power control
Cellular network radio interface, power control, handoffs, roaming

Session 15: Broadcasting technologies I
Historical Review of Radio Broadcasting,   Radio Broadcasting, Principles of Analog TV Broadcasting

Session 16: Broadcasting technologies II

Digital terrestrial television broadcasting (DTTB), Implementation Considerations, DTTB Standards, Existing Systems

Laboratory work
1. Observe the transmission characteristics of different transmission media.
2. Analyse the performance of different analog and digital modulation techniques.
3. Analyse different multiplexing techniques.
4. Observe the radiation pattern of a dipole antenna.
5. Observe the operations using the cellular/GSM trainer panel.
6. Observe the signal in analog TV reception.

Field Visit
1. To visit an industrial location to observe and gain practical deployment and operations of communication systems.

EEX4331 Circuit Theory and Design

Level	4
Course Code	EEX4331
Course Title	Circuit Theory and Design
Credit value	3
Core/Optional	Core (Computer, Electrical, Electronic and communications)
Course Aim/s	Aim of this course is to gain proficiency in different types of analysis of linear electrical systems and design simple linear electrical circuits for given parameters
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Determine steady state voltage and current in a circuit using simplifications techniques and, mesh and nodal analysis. CLO2: Explain the existence of steady state and transient responses of passive circuits using differential equations and Laplace transform. CLO3: Address frequency response of a circuit by applying Fourier analysis. CLO4: Interpret physical systems as two port networks to describe their response to external inputs. CLO5: Realize passive network functions, manually and with software tools, using the knowledge of poles and zeros.

Content	**Outline Syllabus:**
	
	Unit 1: Circuit Simplification Techniques
	    Session 1: Phasors, Complex frequency and s-notation
	    Session 2: Characteristics of electrical sources and circuit elements
	    Session 3: Network theorems I – Kirchhoff's, Superposition, Millman's theorems
	    Session 4: Network theorems II – Thevenin's, Norton's, Reciprocity, Maximum power transfer, impedance matching and compensation
	    Session 5: Mesh analysis and Nodal analysis
	
	Unit 2: Response of Passive Circuits
	    Session 6: Circuit responses as differential equations
	    Session 7: Laplace transform of circuits and signals, Passive circuits as LTIC systems
	    Session 8: Circuit response – Natural response, Forced response, Impulse response and convolution
	    Session 9: Immittance function, and Poles and zeros of a system
	    Session 10: Fourier series representation of electrical signals
	    Session 11: Frequency response of passive circuits using Fourier transform – Tuned circuits and resonance
	
	Unit 3: Network Analysis and Synthesis
	    Session 12: Two port networks
	    Session 13: Network realization methods – Foster forms for LC, RC and RL
	    Session 14: Network realization methods – Cauer forms for LC, RC and RL
	    Session 15: RLC network synthesis
	    Session 16: Filter design I – T circuit, Pi circuit, Constant K, m-derived methods
	    Session 17: Filter design II – Butterworth, Chebychev, Gyrator, Active filter
	    Session 18: Introduction to circuit simulation software
	    Session 19: Numerical computing software for circuit analysis
	
	Laboratory Work:

1.
    a. Verification of basic circuital theorems
    b. Observe the response of 1st and 2nd order passive circuits
2.
    a. Verification of two port network model
    b. Network realization using foster and Cauer methods of network synthesis

Design Project:
    Design passive one port networks and two port filter circuits according to given parameters

EEX4332 Electrical power

Level	4
Course Code	EEX4332
Course Title	Electrical power
Credit value	3
Core/Optional	Core (Computer, Electronic and communications,)
Course Aim/s	To provide basic knowledge of power distribution and utilization of electrical power, including economical consideration.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Identify and explain the techno-economical issues related to generation, transmission and distribution of electrical power and its utilization. CLO2: Apply electrical engineering knowledge to gain fundamental understanding of electrical installations and associated electrical wiring regulations. CLO3: Apply safety measures in handling electricity. CLO4: Describe the different categories of electrical machines, their principles of operation, the underlying electromagnetic principles and applications. CLO5: Explain basic operations of AC and DC electrical machines. CLO6: Compute thermal and electrical ratings of motors under normal and specified operating environments.

| Content (Main topics, sub topics) | **Outline Syllabus:**

Unit 1: General aspects of electrical engineering
    Session 1: Technical factors affecting economics of electricity supply
    Session 2: Electricity tariffs and the economy of power factor improvements
    Session 3: Practical aspects of electric power utilization
    Session 4: Distribution networks
Unit 2: Electrical Installations
    Session 5: Introduction to electrical installation and IEE wiring regulations
    Session 6: Fundamental requirements for safety
    Session 7: Electrical protection
Unit 3: Electrical Machines
    Session 8: Introduction to transformers
    Session 9: Practical transformers
    Session 10: Auto transformers and instrument transformers
    Session 11: Introduction to electrical machines
    Session 12: The single phase induction motor
    Session 13: The three phase induction motors
    Session 14: DC machine theory
    Session 15: DC motors and generators |

Session 16: Introduction to special purpose motors and drives
Session 17: Introduction to synchronous machines
Unit 4: Operational aspects of electrical machines
    Session 18:Thermal rating of electrical machines
    Session 19: Operational aspects of electric motors
    Session 20: Power system harmonics
    Session 21: Energy storage devices

Laboratory work:

1. Perform open circuit test and short circuit test on a single phase transformer
2. Determine transformer performance parameters
3. Determine characteristics of fuses and MCBs
4. Correction of power factor in AC circuits
5. Measurement of power and energy
6. Determine characteristics of plain compound DC motor
7. Determine characteristics of three-phase induction motor

EEX4351 ElectronicsII

Level	4
Course Code	EEX4351
Course Title	ElectronicsII
Credit value	3
Core/Optional	Core (Computer/Electrical/Electronics)
Course Aim/s	To understand the principles of operation and design of electronic circuits.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Describe coders, multiplexers, counters to design FSM. CLO2: Apply the functionalities of ADCs and DACs in given application scenarios. CLO3: Explain the operation of power electronic devices and circuits for control of ac power. CLO4: Analyze linear and switch mode power supply circuits. CLO5: Analyze single and multi-stage transistor amplifier-circuits using small-signal transistor models. CLO6: Analyze power-amplifier circuits for power utilization and efficiency calculations. CLO7: Analyze and design active analog-filters and oscillator circuits. CLO8: Analyze the systems and find the related faults and during the process of PCB manufacturing in such systems.

Content (Main topics, sub topics)	**Outline Syllabus:**
	
	Unit 1: Basic combinatorial circuit design
	    Session1: Arithmetic logics, coders, multiplexers
	    Session2: Design asynchronous/synchronous counters and state machines (Mealy & Moore)
	Unit 2: Mixed Signal Circuits
	    Session3: ADC
	    Session4: DAC
	Unit 3: Power Electronic Devices
	    Session5: Thyristors and the controlled rectification action of a thyristor in power control circuits
	    Session6: Triac, Diac and Uni-junction transistor in operation in circuit
	    Session7: Circuit protective elements
	Unit 4: Switch mode power supplies
	    Session8: Switch mode power supply
	    Session9: Converters and inverters

	Unit 5: Transistor amplifiers
	Session10: Introduction to FET modeling
	Session11: Transistor amplifiers using small signal equivalent circuits
	Session12: Frequency response of an amplifier
	Session13: Simple and multistage transistor amplifier circuits
	Session14: Classes of power amplifiers and their power efficiency
	Session15: Introduction to MOS transistor circuits: nMOS, CMOS, pMOS
	Unit 6: Operational amplifier circuits, oscillators and advanced applications
	Session 16: Feedback controls used in amplifier design
	Session 17: Advanced applications of operational amplifiers, including Schmitt trigger circuits
	Session 18: Active filters
	Session 19: Oscillators
	Unit 7: Faults in electronic circuits
	Session 20: Failure modes of components: active and passive components, integrated circuits.
	Session 21: Analysis of faults in electronic circuits
	Laboratory Work:
	1. Design and evaluate a linear power supply unit.
	2. Analyze the use of power electronic devices such as thyristors and triacs to calculate the usage of power in different applications.
	3. Analyze the faults in electronic circuits.
	Design and test simple counter circuits

EEX4436 Microprocessors and Interfacing

Level	4
Course Code	EEX4436
Course Title	Microprocessors and Interfacing
Credit value	4
Core/Optional	Core (Computer, Electrical, Electronic & Communication, Mechanical)
Course Aim/s	To provide knowledge to build simple microprocessor based systems.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Describe the software design with an assembly language and/or a high-level language for typical embedded systems applications using modern tools and approaches for development and debugging. CLO2: Demonstrate digital interfacing using both parallel and asynchronous/synchronous serial techniques incorporating typical on-chip modules as such as general purpose I/O, timers, and serial communication modules. CLO3: Describe the use of the periodic interrupts, waveform generation, and time measurement in micro-controller based systems. CLO4: Demonstrate analog interfacing using analog-to-digital and digital-to-analog converters connected to sensors and actuators. CLO5: Design a micro-controller based system for a real-world application fulfilling the given specifications.
Content	**Outline Syllabus:** Unit 1: Microprocessors and Microcontrollers Session 01: Overview of Microprocessors and Microcontrollers Session 02: Characteristics of microprocessors and microcontrollers Session 03: Hardware overview of a microcontroller based systems Session 04: Software tools for microcontroller based systems

Session 05: Software design for microcontroller based systems

Unit 2: Inputs and outputs

Session 06: Input and output peripherals

Session 07: Memory system design

Session 08: Different I/O configurations of a microcontroller

Session 09: Polled driven and interrupt driven Programming

Unit 3: Timers and counters

Session 10: Timers and counters

Session 11: Time measurement and Programming of the hardware timers

Session 12: Design procedures and algorithms for the microcontrollers based applications.

Unit 4: Communication

Session 13: Parallel I/O versus serial I/O

Session 14: Asynchronous serial interface

Session 15: Synchronous serial interface

Session 16: Controller area network and applications

Unit 5: Sensors and actuators

Session 17: Sensors and interfacing

Session 18: Actuators and interfacing

Unit 6: Microcontroller based system design

Session 19: Mixed signal interfacing techniques

Session 20: Controlling mixed signal circuits

Session 21: Design of data acquisition systems

Session 22: Microcontroller based system design

Laboratory Work:

1. Demonstrate the functionalities of the microcontroller development board using self-test method.
2. Demonstrate the basic interfacing techniques using mixed signal circuits, I/O peripherals, sensors and actuators.
3. Implement a designed system using microcontroller development board as a prototype model

Design Project:

Apply microcontroller based systems design concepts in real world application

Analysis design parameters to design microcontroller based systems.

EEX5150 Electronics Circuit Design

Level	5
Course Code	EEX5150
Course Title	Electronics Circuit Design
Credit value	1
Core/Optional	Core (Electronics)
Course Aim/s	To construct design and implementation of electronic circuits.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Design electronic circuits to a given scenario. CLO2: Construct and test the designed electronic circuits.

EEX5333 Communication Theory & Systems

Level	5
Course Code	EEX5333
Course Title	Communication Theory & Systems
Credit value	3
Core/Optional	Core
Course Aim/s	To provide comprehensive theoretical and practical knowledge related to communication systems.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Perform standard statistical signal analysis. CLO2: Evaluate baseband signal processing techniques in communication systems. CLO3: Perform transmission line matching using Smith chart analysis. CLO4: Design antenna systems and matching circuits for a given application. CLO5: Perform network planning and management activities.

Content (Main topics, sub topics)	**Outline Syllabus:**
	
	Unit 1: Communication Signal Analysis
	    Session 1: Review of signal classifications; Fourier series and transforms
	    Session 2: Review of convolution theorem, impulse response, LTI systems
	    Session 3: Review of probability theory, Introduction to random variables and stochastic processes
	    Session 4: Autocorrelation and cross correlation, power spectral density and energy spectral density, stationary and Ergodic processes/signals
	    Session 5: Noise characteristics, geometric representation of signals and noise, performance in AWGN channels, optimum detection
	Unit 3: Broadband Communication
	    Session 6: Introduction to Broadband communication and principles
	    Session 7: Wired Broadband Technologies, Broadband Optical Access, Wireless Technologies, Satellite Broadband
	Unit 4: Optical Communication
	    Session 8: Optical communication fundamentals
	    Session 9:Signal degradation of optical fibers
	    Session 10: Optical transmitters and receivers
	    Session 11: Multiplexing strategies
	    Session 12: Optical communication systems design considerations
	Unit 5: Transmission Lines
	    Session 13: Line parameters
	    Session 14: Impedance matching; single-stub, double-stub
	    Session 15: Smith chart

Unit 6: Antenna Principles
     Session 16 : Antenna design, horn, dielectric lens, micro strip, parabolic antennas
     Session 17: Antenna matching
Unit 7: Advanced Tele traffic Engineering and Network Planning
     Session 18: Introduction to queuing theory
     Session 19: Erlang-B and Erlang-D formulas
     Session 20: Network planning, capacity, frequency; Network management, 5 elements of network management; telecommunication Regulations in Sri Lanka

Laboratory work:

1. Design an appropriate antenna for a given specification.
2. Analyze transmission line characteristics for different conditions.
3. Fiber-optic performance analysis.
4. Analysis of noise performance in electronic circuits.

EEX5351 Digital Electronic Systems

Level	5
Course Code	EEX5351
Course Title	Digital Electronic Systems
Credit value	3
Core/Optional	Core
Course Aim/s	To provide knowledge to design and skills for analysis to implement digital systems on appropriate hardware platforms.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to CLO1: Apply the concepts of basic timing issues, including clocking, timing constraints, and propagation delays during the design process. CLO2: Develop complex digital systems in a hierarchical fashion using top-down and bottom-up design approaches CLO3: Verify the digital systems design via digital circuit simulation using a hardware descriptive language. CLO4: Implement digital system designs using Programmable platforms such as FPGAs and PLDs. CLO5: Explain the types and characteristics of common faults that occur in digital electronic systems. CLO6: Discuss different computer-aided testing tools for circuit simulation, fault diagnosis and ATPG.

Content (Main topics, sub topics)	**Outline Syllabus:**
	Unit 01: Design Approaches
	     Session 01: Design Approaches and Constraints of Digital Systems
	     Session 02: Digital System Modelling Techniques
	     Session 03: Designing with Sequential MSIs
	Unit 02: Digital Design Hardware
	     Session 04: Architecture of PLDs, PLAs, CPLDs, and FPGAs
	     Session 05: Implementation of digital systems using PLDs, PLAs, CPLDs, FPGAs
	Unit 03: Clock Generation and Timing Analysis
	     Session 06: Clock Generation
	     Session 07: Propagation, delay, Timing and Duty Cycle parameters
	Unit 04: Finite State Machines and State based Representations
	     Session 08: FSM and State Diagrams
	     Session 09: Design and implementation using FSMs
	Unit 05: CMOS Logic Gates
	     Session 10: CMOS Design of Logic Gates

Session 11: Analysis of the operation in each logic gate design
Unit 06: Logic Faults
      Session 12: Logic faults and Fault analysis of the CMOS logic gates
      Session 13: Fault Diagnosis: Sequential and Combinational Circuits
Unit 07: VHDL Programming
      Session 14: Introduction VHDL - Basic terminology and language elements
      Session 15: Behavioral Modeling
      Session 16: Dataflow Modeling
      Session 17: Structural Modeling
      Session 18: Test bench Modeling
Unit08: VLSI Testability
      Session19: Introduction VLSI, VLSI Testability and ATPG
      Session20: Design Styles: SOC and ASIC

Laboratory work:

1. Design a digital electronic system for a given application scenario.
2. Implement the design on FPGA and verify the implementation

Mini Project

      Provide a critical analysis based on a comprehensive literature survey on a given topic

EEX5360 Signals & Systems

Level	5
Course Code	EEX5360
Course Title	Signals & Systems
Credit value	3
Core/Optional	Core (Electronic, Computer)
Course Aim/s	To provide knowledge in time and frequency domain signals, and to analyze their behavior when applied to systems.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Describe the characteristics/properties of different types of signals and systems. CLO2: Describe the properties of Linear Time Invariant (LTI) systems. CLO3: Analyze signals and systems using time and frequency domain techniques. CLO4: Design analog and digital filters using appropriate design tools and techniques for a given specification. CLO5: Implement a digital filter for a given application scenario using real-time hardware platform.
Content (Main topics, sub topics)	**Outline Syllabus:** **Unit 1: Introduction to Signals & Systems** Session 1: Signal types and classifications Session 2: Basic operations on signals Session 3: Types of elementary signals Session 4: Signal Sampling and Reconstruction Session 5 : System properties and classification **Unit 2: Time Domain Analysis of Systems** Session 6: Differential and difference equation representation of LTI systems Session 7: Convolution: Impulse response representation for LTI systems **Unit 3: Frequency Domain Analysis of Systems** Session 8: Laplace transforms

Session 9: Fourier analysis
Session 10: Fourier transforms
Session 11: Properties of Fourier representations
Session 12: Z-Transforms

Unit 4: Filter Design
Session 13: Filter characteristics in LTI systems
Session 14: Analog filters
Session 15: Introduction to Digital filters
Session 16: Digital filters design
Laboratory work:

1. Analyze the Fourier series representation of a periodic signal and sampling.
2. Observe the filter characteristics (Filtering a square wave signal).
3. Compare the filter characteristics (using appropriate software).
4. Implement filter designs using appropriate hardware.

Design Project:

Design a digital filter circuit for given specifications.

EEX5434 Data Communications and Networking

Level	5
Course Code	EEX5434
Course Title	DataCommunicationsandNetworking
Credit value	4
Core/Optional	Core (Electronic, Computer)
Course Aim/s	To provide knowledge in technologies of data communication and networking standards in different application scenarios.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Explain the fundamentals of data communication systems including functional blocks, historical development and current & future trends. CLO2: Analyze a communication process by simplifying into sub processes using layered architecture models. CLO3: Analyze the functions, services and protocols applicable to each OSI layer. CLO4: Evaluate various types of networks based on their architecture, performance and applications. CLO5: Apply routing algorithms to minimize the traffic congestion in a network. CLO6: Explain the security concepts in computer networks. CLO7: Design and implement a data network to meet a given set of requirements.

Content	**Outline Syllabus:**
	
	Unit 1: Introduction to Data Communications
	    Session 1: Introduction
	    Session 2: Network architecture
	    Session 3: Types of Networks
	    Session 4: Cellular Mobile Networks
	Unit 2: Physical layer
	    Session 5: Data Transmission
	    Session 6: Transmission media
	    Session 7: Digital data communication techniques
	    Session 8: Multiplexing techniques
	    Session 9 : Data encoding
	Unit 3: Data Link Layer
	    Session 10: Data link layer functions and services
	    Session 11: Media Access Control (MAC) and Logical link control (LLC)
	    Session 12: LAN switching

Session 13: Virtual LANs
Unit 4: Network Layer
      Session 14: IPv4 addressing
      Session 15: IPv6 addressing
      Session 16: Network Routing
Unit 5: Transport layer
      Session 17: Functions and services of transport layer
      Session 18:Transmission Control Protocol (TCP)
      Session 19: User Datagram Protocol
Unit 6: Application layer
      Session 20: Mail services (email)
      Session 21: Domain Name system (DNS)
      Session 22: File transfer, access and management
      Session 23: Voice and Video over IP
Unit 7 : Internetworking
      Session 24: Internet architecture and protocols
      Session 25: Internet security
Unit 8: Software Defined Networks and Network Function Virtualization
      Session 26: Software Defined Networks
      Session 27: Network Function Virtualization

Laboratory work :

1. Design and implementation of a LAN
2. Configuration of switches and routers and testing the switching and routing function
3. Allocation of IP addresses
4. Setting up (a) a NAT, (b) VLAN and (c) VoIP system
5. Use network simulators and network analyzers for design and analyses
6. Capture and analyze network traffic using Wireshark and Matlab.

EEX5563 Computer Architecture and Operating Systems

Level	5
Course Code	EEX5563
Course Title	Computer Architecture and Operating Systems
Credit value	5
Core/Optional	Core (Electronics and Communication)
Course Aim/s	To provide required knowledge and skill of architecture and operation system of a computer system
Course Learning Outcomes (CLO):	At the completion of this course student will be able to : CLO1: Explain the functions of components, data-path and the control unit of a processor when executing its instructions. CLO2: Describe the role of an operating system in managing system resources and interfacing hardware and software elements, and functions of I/O system. CLO3: Explain hierarchical memory design, memory organizations and impact of resource management for improving overall performance of a computer system. CLO4: Define design parameters of an operating system module to manage the resources of a computer for a given task.
	CLO5: Analyze performance of computer systems considering cost, reliability and security. CLO6: Demonstrate the ability to write I/O Programs for a target platform.
Content (Main topics, sub topics)	Outline Syllabus: Unit 1: Overview of a Computer System (1 session)

	• History of computing, Hardware and software (Role and purpose of the operating system, History of operating system (OS) development, Architecture of OS)
	• Functionality of an OS (Design issues: efficiency, robustness, flexibility, portability, security, compatibility)

Unit 2: Performance (3 sessions)

- Performance metrics (clock rate, MIPS, Cycles per instruction, benchmarks)
- Averaging metrics (arithmetic, geometric and harmonic)
- Amdahl's law
- Performance measures in OS (evaluation models used to evaluate a system)

Unit 3: Representation of Data and Information (1 session)

- Non numeric data and information (character codes, strings, graphical data, Representation of records and arrays)

Unit 4: Organization of a Computer System (9 sessions)

- Von Neumann architecture (organization of the classical von Neumann machine and its major functional units)
- How a Programme is executed in a computer (how an instruction is executed in a processor, instruction fetch, decode, and execution)
- Role of the OS in execution (state transition diagram, ready list and PCB;
- Dispatching and context switching)ISA (Instruction sets – representation at the machine level and in the context of a symbolic assembler; different instruction formats, such as addresses per instruction and variable length vs. fixed length formats and types: data manipulation, control, I/O)
- Assembly language Programming (implementation of fundamental high-level Programming constructs at the machine-language level)
- Addressing modes
- Concurrent execution, role of interrupts ("mutual exclusion" problem and some solutions)
- Implementing sub rooting calls, interrupts and I/O
- Deadlocks (causes, conditions, prevention; Models and mechanisms: semaphores, monitors, condition variables, rendezvous)

Unit 5: Managing the Processor (3 sessions)

- Scheduling processes and policies (Pre-emptive and non-preemptive scheduling algorithms, Schedulers and policies, priority, performance comparison, and fair share schemes)
- Processes and threads
- Deadlines and real-time issues (static and dynamic approaches to real-time scheduling)

Unit 6: Memory System: Design and Managing (6 sessions)

- Storage systems (technology, Coding, data compression, and data integrity)
- Memory organization (memory hierarchy, operations, Latency, cycle time, bandwidth, and interleaving)
- How to manage memory (principles of memory management, Overlays, swapping and partitions)
- How to manage memory (paging and segmentation, Placement and replacement policies)
- Cache memory (address mapping, block size, replacement and store policy)
- Virtual memory (page table, TLB, virtual memory management)
- Fault handling and reliability

Unit 7: I/O System (4 sessions)

- I/O fundamentals (handshaking, buffering, Programmed I/O, interrupt-driven I/O)
- Interrupt structures: vectored and prioritized, interrupt acknowledgment
- External storage (physical organization, and drives, RAID architecture)
- Buses (bus protocols, arbitration, direct-memory access (DMA))
- Device management (serial and parallel devices, relationship between the physical hardware and the virtual devices, Buffering strategies)
- File system (Files: data, metadata, operations, organization, buffering, sequential, non-sequential; Directories: contents and structure; File systems:

	partitioning, mount/unmount, virtual file systems; Standard implementation techniques; Memory-mapped files; Special-purpose file systems; Naming, searching, access, backups)
	Unit 8: Functional Organization (4 sessions)
	• Implementation of data paths (Register transfer notation, alternative implementation of data paths);
	• Control unit (hardwired realization vs. micro programmed realization)
	• Pipelining (Instruction, arithmetic pipelines instruction-level parallelism (ILP))
	Unit 9: Alternative Architectures (2 sessions)
	• Multiprocessors (SIMD, MIMD, VLIW, EPIC, Systolic architecture) and OS support (Multiprocessor issues: spin-locks, re-entrancy)
	• Interconnection networks (hypercube, shuffle-exchange, mesh, crossbar)
	• Memory systems for alternative architectures (Shared memory systems, Cache coherence, Memory models and memory consistency)
	Unit 10: Approaches for performance enhancements (2 sessions)
	• RISC architectures.
	• Superscalar architecture, Branch prediction, Prefetching, Speculative execution, Multithreading, Scalability, how OS supports in these approaches
	Unit 11: Contemporary architectures (1 session)
	Trends in processor architecture and OS support for them (Special concerns in real-time systems)

EEX6181/EEX6182/EEX6183 Research Methodology and Project Identification (Computer/Electrical/Electronic and Communication Engineering)

Level	6
Course Code	EEX6181/EEX6182/EEX6183
Course Title	Research Methodology and Project Identification (Computer/Electrical/Electronic and Communication)
Credit value	1
Core/Optional	Core
Course Aim/s	To provide the student with knowledge of research based approach in providing solu engineering problems
Course Learning Outcomes (CLO):	After completion of this course student will be able to:
	CLO1: Demonstrate the knowledge of types of research designs, quantitative and qualitative forms of research, and use the most appropriate design for a given issue.
	CLO2: Create problem statement, purpose statement, research problem and objective of a research.
	CLO3: Conduct a literature survey effectively in view of information collection with regard to a given issue, critically evaluate outcomes of literature survey, and document them with recognized referencing methods.
	CLO4: Prepare a research proposal based on preliminary investigations.
	CLO5: Describe ethical issues concerning research and indentify and avoid such issue in engineering research.
	CLO6: Plan and execute substantially research based projects with innovativeness and initiative and with a personal autonomy and accountability.
	CLO7: Prepare research abstracts and full length articles according to standard formats.
Content (Main topics, sub topics)	**Outline Syllabus:** Session 01: Meaning and objectives of research Session 02: Types of research

Session 03: Literature survey and referencing methods
Session 04: Defining a research problem
Session 04:Prepartion of a research proposal
Session 05:Ethics in research
Session 06:Dessemination of research outcomes and patenting

Activities:
1. Workshop on research problem formulation

EEX6253 Physical &Opto Electronics

Level	6
Course Code	EEX6253
Course Title	Physical & Opto Electronics
Credit value	2
Core/Optional	Core (Electronics)
Course Aim/s	To provide knowledge of the physical structure and principles of operation of semiconductor and opto-electronic devices
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Analyze energy band structure of metals, semiconductors and insulators. CLO2: Analyze the operations and characteristics of basic semiconductor devices using atomic structures and energy band diagrams. CLO3: Explain the operations and characteristics of basic optoelectronic devices. CLO4: Reflect on semi-conductor device application based on related research.

Content (Main topics, sub topics)	**Outline Syllabus:**
	
	Unit 1: Physical Electronics
	     Session 1: Background material from Physics: Energy levels and energy bands, conduction in metals
	     Session 2: Semiconductor Fundamentals: Conduction in semiconductors
	     Session 3:The pn-junction: Semiconductor diode
	     Session 4: Bipolar junction transistor characteristics
	     Session 5: MOS field-effect transistors
	     Session 6: Junction field-effect transistors
	Unit 2 : Optoelectronics
	     Session 7: Introduction to optoelectronics
	     Session 8: Optical sources: LEDs, Laser Diodes
	     Session 9: Optical detectors
	     Session 10: Optical communication devices and applications
	
	Design Project:
	     Design an opto-electronic system for a given specification and simulate the output characteristics.

EEX6339 Wireless Communication

Level	6
Course Code	EEX6339
Course Title	Wireless Communication
Credit value	3
Core/Optional	Core (Electronic)
Course Aim/s	To provide knowledge and analytical skills to develop and evaluate the performance of wireless communication systems.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Model and evaluate different wireless channels. CLO2: Apply suitable modulation, coding and equalization techniques in communicating digital signals over impaired channels. CLO3: Apply diversity techniques in wireless communication. CLO4: Design cellular systems for high performance. CLO5: Evaluate different ad-hoc wireless networks and broadband wireless networks. CLO6: Analyze the latest trends in wireless communication.

Content (Main topics, sub topics)	**Outline Syllabus:**
	Unit 01: Wireless radio channel
	    Session 1: Free space propagation and path loss models
	    Session 2: Noise, shadowing and multi-path fading
	    Session 3: Statistical fading distributions
	    Session 4: Empirical fading distributions
	Unit 02: Digital signal transmission on impaired channels
	    Session 5: Digital modulation & detection
	    Session 6: Coding for the wireless channel-1
	    Session 7: Coding for the wireless channel-2
	    Session 8: Equalization
	Unit 03: Diversity
	    Session 9: Diversity schemes
	    Session 10: Receiver combining schemes
	    Session 11: Multiple input - multiple output (MIMO) systems
	    Session 12: Space - time coding
	Unit 04: Cellular systems
	    Session 13: Fundamentals of cellular systems - multiple access
	    Session 14: Cellular traffic and capacity, interference and cell planning
	    Session 15: Dynamic resource allocation
	    Session 16: Ad-hoc wireless systems
	Unit 05: Broadband wireless systems
	    Session 17: FHSS, DSSS and CDMA
	    Session 18: OFDM-Multi carrier modulation
	    Session 19: Advanced cellular broadband techniques
	    Session 20: Emerging topics in wireless communication
	
	Mini Project:
	
	    Comprehensive study of current advancements in wireless communications.

EEX6441 Electromagnetics and Wave Propagation

Level	6
Course Code	EEX6441
Course Title	Electromagnetics and Wave Propagation
Credit value	4
Core/Optional	Core (Electrical, Electronic)
Course Aim/s	To provide knowledge on classical electromagnetic field theory and apply them to electromagnetic fields and wave propagation problems in related engineering applications.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Explain fundamentals of electromagnetic theories. CLO2: Analyze the characteristics of electric fields in real-world applications using electro-statical theories. CLO3: Analyze the characteristics of magnetic fields in real-world applications using magneto-static theories. CLO4: Analyze time-varying electromagnetic fields using wave equations. CLO5: Verify the theories of time-varying electromagnetic fields for propagating waves. CLO6: Reflect on an electromagnetic application based on related research.
Content	**Outline Syllabus:** Unit 1: Mathematical Preliminaries Session 1: Introduction to vector fields Session 2: Vector calculus: Gauss' Divergence Theorem and Stokes' Theorem Unit 2: Static Electric Fields Session 3: Fundamentals of electrostatics Session 4: Poisson's and Laplace's Equations, Uniqueness Theorem Session 5: Method of Images, Electrostatic boundary value problem Session 6 :Behavior of Electrical materials in Electric fields Unit 3: Static Magnetic Fields Session 7: Biot- Savart Law and Ampere's Circuital Law Session 8: Magnetic Flux Density and Vector Potentials Session 9: Boundary Condition Magnetic Fields Session 10 : Self Inductance and Mutual Inductance Unit 4: Time Varying Fields & Maxwell's Equations Session 11: Faraday's Law of electromagnetic Induction Session 12: Maxwell's Equations Session 13: Boundary Conditions for Electromagnetic fields Session 14: Time Harmonic Fields Unit 5: Plane Wave propagation Session 15: Electromagnetic wave and free space propagation Session 16: Characteristics of wave propagation Session 17: Polarization Session 18: Reflections of EM waves Session 19: Guided wave propagation, waveguides, Session 20: TE and TM modes, power flow, cavity resonators Mini Project: Study and present a real life electromagnetic application

EEX6450 Analog Electronic Systems & Instrumentation

Level	6
Course Code	EEX6450
Course Title	Analog Electronic Systems & Instrumentation
Credit value	4
Core/Optional	Core (Electronic)
Course Aim/s	To understand the operation of analog electronic systems, analyze their architecture, behavior, and simulate the characteristics and understand electronic instrumentation principles.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to: CLO1: Model transistor amplifier circuits using parameter modeling techniques. CLO2: Evaluate the characteristics of multi-stage amplifiers using parametric models. CLO3: Design multi-stage transistor amplifiers for desired frequency responses. CLO4: Design advanced operational amplifier circuits. CLO5: Evaluate modern electronic instrumentation techniques.

Content	**Outline Syllabus:**
	
	Unit 1: Modeling of Multistage Transistor Amplifiers
	    Session 1: Low frequency modeling of multi-stage BJT amplifiers
	    Session 2: BJT amplifiers at high frequencies
	    Session 3: Low frequency modeling of field effect transistors (FETs)
	    Session 4: FET amplifiers at high frequencies
	Unit 2: Frequency Response of Amplifiers
	    Session 5: Frequency response of single stage amplifiers
	    Session 6: Frequency response of multi stage amplifiers
	Unit 3: Stability of amplifiers
	    Session 7: Stability of amplifiers with feedback
	    Session 8: Stability compensation
	Unit 4: Operational Amplifiers
	    Session 9: Operational amplifier front end, practical op-amp practical parameters, compensation techniques
	    Session 10: Temperature and time drifts, large signal behavior, frequency compensation
	Unit 5: Modern Instrumentation
	    Session 11: Physical quantities to measurable parameters
	    Session 12: Fundamentals of instrumentation techniques
	    Session 13: Modern instruments and operations
	    Session 14: Performance of measuring instruments
	    Session 15: External effect to measurements
	    Session 16: Calibration of instruments
	
	Laboratory work (Experiments):
	
	1. Design a multi-stage amplifier circuit.
	2. Implement a multi-stage amplifier circuit.
	3. Design an oscillator circuit for a given specification.
	4. Implement an oscillator circuit for a given specification.
	5. Design a filter circuit for a given specification.
	6. Implement a filter circuit for a given specification.
	7. Measurements with the spectrum analyser.
	8. Design of a simple measuring instrument using software tools.
	
	Design Project:
	
	    Design an advanced analog electronic circuit for a given specification.

EEX7333 Microwave Devices and Antennas

Level	7
Course Code	EEX7333
Course Title	Microwave Devices and Antennas
Credit value	3
Core/Optional	Core (Electronic)
Course Aim/s	To impart knowledge and design skills to use suitable microwave devices and antennas in communication systems.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to CLO1: Apply basic electromagnetic theories for the calculations of waveguides and resonators. CLO2: Describe and analyze simple microwave junctions and their applications. CLO3: Describe the operation and characteristics of microwave components and semiconductor devices. CLO4: Apply appropriate microwave antennas for given application scenarios.

Content	**Outline Syllabus:**
	
	Unit 1: Review of Basic Electromagnetic
	    Session 01: Maxwell's Equations; The Wave equations; Plane wave in free space; Plane TEM waves in conducting Medium; Plane TEM waves in loss-less dielectric Medium.
	    Session 02: Power flow in electromagnetic field the Poynting vector;
	    Session 03: Electromagnetic boundary conditions; Reflections of Electromagnetic waves; Reflections of Electromagnetic waves from a conducting surface.
	Unit 2: Microwave Transmission lines
	    Session 04: Introduction to microwave transmission lines
	    Session 05: Transmission line theory
	    Session 06: Transmission line as a distributed component
	    Session 07: Microwave substrate transmission lines
	Unit 3: Waveguide Theory
	    Session 08: Fields within a waveguide and modes of propagation (TE, ™, and TEM).
	    Session 09: Rectangular waveguide- Characteristics of TE and TM waves in rectangular waveguide; Currents in waveguide walls; Dominate TE10 Mode in rectangular waveguide.
	    Session 10: Power flow in waveguides; Attenuation in waveguides; waveguide excitation;
	    Session 11: Waveguide components.
	Unit 4: Microwave Antennas
	    Session 12: Review of antenna basics
	    Session 13: Microwave dipole
	    Session 14: Yagi-Uda antenna
	    Session 15: Design of a log-periodic antenna
	    Session 16: Helical antenna
	    Session 17: Design of Lens and Reflector antennas
	Unit 7: Microwave Sources
	    Session 18: Magnetron
	    Session 19: Other sources: Klystron, Two cavity klystron, reflex klystron, Magnetron, Slow wave structures, Travelling wave tube
	    Session 20: Semiconductor sources
	Unit 8: Microwave Circuits
	    Session 21: Microwave ferrite components
	    Session 22: Microwave semiconductor components
	    Session 23: Basics of Microwave Circuit Design
	
	Laboratory work (Experiments):

	1. Observe the microwave generation methods. 2. Observe the different waveguide excitation methods. 3. Study the microwave propagation characteristics in different devices. 4. Observe the characteristics of different microwave antennas. Design selected microwave antennas for given specifications.

EEX7355 Comprehensive Electronics Design

Semester and Level	Level 7
Course Code	EEX7355
Course Title	Comprehensive Electronics Design
Credit Value	3
Core/ Optional	Core (Electronic & Communication)
Course Aim/s	To provide an opportunity to apply the electronics design concepts in the design and implementation of advanced electronic systems.
Course Learning Outcomes (CLOs)	At the completion of this course student will be able to: CLO1: Investigate design requirements for a given case in (electronic and communication) engineering. CLO2: Design a system according to the case requirement using (electronic and communication) engineering knowledge. CLO3: Implement a prototype or a simulation model for the designed system. CLO4: Evaluate the performance of implemented prototype or the simulation of the given case. CLO5: Recommend necessary improvements to the implemented electronic system design, considering evaluation results.

Content (Main topics ,sub topics)	**Outline Syllabus:**
	
	Unit 1: Comprehensive electronics design
	    Session 1:P roject acquisition
	    Session 2: Writing a project proposal
	    Session 3: Design concept
	    Session 4: Computer aided design
	    Session 5: Conceptual prototype design and implementation
	    Session 6: Measuring and evaluation of performance of a prototype
	    Session 7:Prototype fabrication
	    Session 8: Professional and ethical development
	
	Design Projects:
	
	    Design a system for a given scenario/application.
	    Evaluate performance and recommend improvements to the design.

EEY4181/EEY4182/EEY4183 Group Project (Computer/Electrical/Electronic Engineering)

Level	4
Course Code	EEY4181/EEY4182/EEY4183
Course Title	Group Project (Computer/Electrical/Electronic Engineering)
Credit value	1
Core/Optional	Core
	100
Course Aim/s	Aim of this course is to instil in learners the ability to investigate problems and/or issues by following a methodical and a shared approach, to discover the required areas of knowledge in providing sustainable solutions.
Course Learning Outcomes (CLO):	CLO1: To apply concepts and principles in a related area of study; analyze information and suggest solutions to selected problems. CLO2: To communicate successfully, the results of analysis and arguments to specialist and non-specialist audiences. CLO3: To exercise responsibilities as an individual and as a team. CLO4: To display qualities and transferable skills as well as subject specific skills necessary for employment, carry out further training and to manage their own learning.
Content (Main topics, sub topics)	The content is based on prior learning and information researched.

EEY7881/EEY7882/EEY7883 Engineering Research Project (Computer/Electrical/Electronic Engineering)

Level	7
Course Code	EEY7881
Course Title	Engineering Research Project (Computer/Electrical/Electronic Engineering)
Credit value	8
Core/Optional	Core
	800
Course Aim/s	Aim of this course is to carry out an industry-based project during the final year, in order to demonstrate learners' exposure to professional engineering practice. It should also demand individual analysis and judgement, assessed independently from the work of others. Learners are encouraged to undertake Projects in their main discipline or to undertake projects of inter-disciplinary nature.
Course Learning Outcomes (CLO):	CLO1: To engage with selected information in the research literature to construct new knowledge related to the Research Question, the learner plans to investigate. CLO2: To plan out the investigation of a complex engineering problem using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. CLO3: To display qualities and transferable skills as well as subject specific skills necessary to communicate successfully, to a specialist audience. CLO4: To construct/create/make/build knowledge based on established pre-knowledge and techniques, using the Scientific Method. CLO5: To apply suitable/recognized methods, tools and procedures when executing the work.

	CLO6: To demonstrate individual analysis and judgment based on reflective learning (Concrete Experience, Reflective Observations, Abstract Conceptualization, and Active Experimentation) CLO7: To verify accuracy and relevance of the proposed methodology and research findings. CLO8: To design and develop suitable concepts and models (graphical, mathematical, statistical, prototype) to analyses, interpret and communicate research findings. CLO9: To disseminate research findings in a professional and ethical manner.
Content	The content is based on prior learning and information researched.

EEW5403 Industrial Training II (Electronic & Communication)

Level	4
Course Code	EEW5403
Course Title	Industrial training II
Credit value	4
Core/Optional	Core (Electronics and Communications)
Course Aim/s	Aim of this course is to prepare learners for their future employment in the electronics and telecommunications industries by gaining skills in engineering practices with an exposure to industrial environment including social and ethical responsibilities.
Course Learning Outcomes (CLO):	At the completion of this course student will be able to CLO1: Recall the learned relevant theories, standards, conventions and practices in electronic and communication engineering discipline. CLO2: Apply the relevant methods of engineering practice. CLO3: Apply theories in solving problems in electronics and telecommunications industries. CLO4: Apply standard safety measures and regulatory conformance in electronics and telecommunications industries. CLO5: Demonstrate ethical and socio-economic practices in industry. CLO6: Communicate engineering information effectively to technical and non-technical audiences. CLO7: Demonstrate ability to work effectively in team environments.
Content	No study materials