SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF ENGINEERING & TECHNOLOGY
Electronics Engineering

Programme Educational Objectives and Outcomes

A. Program Educational Objectives

1. To enable student to achieve immediate employment in Electronics, Communication and IT related industries with appropriate title and compensation.
2. To enable student to analyze and solve Electronics Engineering problems by applying basic principles of mathematics, science, and engineering and also able to use modern engineering techniques, skills, and tools to fulfill societal needs.
3. To enable student to innovate, design and develop hardware and software components.
4. To nurture student to be sensitive to ethical, societal and environmental issues while conducting their professional work.
5. To build strong fundamental knowledge amongst student to pursue higher education and continue professional development in Electronics & other fields
6. To equip student with technical and communication skills in order to be able to function in national/international/multi-cultural corporations and organizations.

B. Program Outcomes

Students attain the following outcomes:

a. an ability to apply knowledge of mathematics, science, and engineering
b. an ability to design and conduct experiments, as well as to analyze and interpret data,
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. an ability to function on multidisciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. a recognition of the need for, and an ability to engage in life-long learning,
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Specific Outcomes (PSOs)

1. **Algorithms** : Graduate can design, realize and validate algorithms for different analog and digital electronic systems

2. **Systems**: Graduate can design, implement and test different analog and digital electronic systems

3. **Self Learning:** Graduate with his sound fundamentals is prepared to comprehend applications of the Electronics engineering through self learning mode

ELECTRONICS ENGINEERING

S.E. ELECTRONICS -I

EN211. ENGINEERING MATHEMATICS-III

At the end of course, students will be able to

1. Solve higher order linear differential equation related to electrical circuit theory
2. Apply Laplace and inverse Laplace transforms for analysis of simple electrical circuits
3. Express a function in terms of sine's and cosines components so as to model simple periodic functions.
4. Solve problems on Z transform and explain its properties
5. Find the relation between two variables for the given data using regression
6. Sketch and explain various probability distribution functions
7. Solve simultaneous linear equations and non linear equations.

EN212. ELECTRONIC CIRCUIT ANALYSIS AND DESIGN- I

At the end of course, students will be able to

1. Elaborate working and applications of diode.
2. Analyze and design unregulated power supply using diode
3. Elaborate working and characteristics of BJT.
4. Analyze and design single stage amplifier and multivibrator.
5. Evaluate FET and MOSFET parameters.
6. Explain applications of FET and MOSFET

EN213. NETWORK THEORY AND ANALYSIS

At the end of course, students will be able to

1. Apply different network theorems and network reduction techniques on DC and AC passive electrical circuits
2. Analyze resonance in a series and parallel circuits.
3. Analyze two port networks
4. Analyze transient response of AC circuits.
5. Apply filter approximations to design analog passive filters.
6. Evaluate the electrical system stability using analytical methods and pole zero diagram

EN214. DIGITAL LOGIC DESIGN

At the end of course, students will be able to

1. Explain underlying concept of digital logic, signal and circuits.
2. Use various logic gates to design a logic circuit.
3. Evaluate various number systems, Boolean algebra and is able to solve relevant problems.
4. Realize CMOS and VLSI families along with their vital parameters.
5. Design combinational and sequential circuits
6. Use concept of synchronous state machine for solving design problems.
7. Use programmable logic devices for designing logic circuits.

EN215. ANALOG COMMUNICATION

At the end of course, students will be able to

1. Student describes basic components of communication system and explains need of modulation
2. Student describes concept of noise and also recognizes its effects.
3. Student describes amplitude and frequency modulation and demodulation and can do analysis in time and frequency domain
4. Student explains nature and behavior of wave propagation and basic principle of different antenna systems
5. simulate components of communication system using simulation software and can interpret results

EN216. OBJECT ORIENTED PROGRAMMING WITH C++

At the end of course, students will be able to

1. Differentiate between C and C++ in terms of data hiding and class and can implement applications using programming with class.
2. Describe significance and implement different types of constructors. He can also explain difference between a constructor and a destructor.
3. Implement structure, types of inheritance and explain importance of inheritance.
4. Implement types of polymorphism- compile type polymorphism, run type polymorphism and virtual function.
5. Use different features of object oriented programming efficiently

S.E. ELECTRONICS -II

EN221. ELECTRICAL MACHINES

At the end of course, students will be able to

1. Explain working, speed control, starting and braking of dc motors and three - phase induction motors.
2. Describe working and application of different single phase special motors.
3. Explain three phase power measurement and power factor improvement methods.
4. Describe three phase transformer connections.

EN222. ELECTRONIC CIRCUIT ANALYSIS AND DESIGN- II

At the end of course, students will be able to

1. Analyze multistage amplifier.
2. Analyze and design feedback amplifier.
3. Analyze power amplifiers.
4. Analyze and design oscillators.
5. Design and analyze timer circuits using IC 555 and some of its applications.
6. Analyze and design transistorized series voltage regulators.
7. Analyze and design voltage regulator using ICs.

EN223. DATA STRUCTURES

At the end of course, students will be able to

1. Implement stack, queues, and linked list.
2. Use recursion
3. Select non linear structures for autonomous realization of simple programs or program parts
4. Implement different searching and sorting technique

EN224. LINEAR INTEGRATED CIRCUITS

At the end of course, students will be able to

1. Explain working of op amp and characteristics of ideal and practical op amp
2. Describe frequency response of op amp
3. Analyze different linear and non linear applications of op amp
4. Design first and second order filter and can analyze oscillators
5. Describe monolithic VCO and its application in PLL
6. Explain data converter techniques and can use monolithic data converters for practical applications.

EN225. SIGNALS AND SYSTES

At the end of course, students will be able to

1. To sketch & label signals, perform arithmetic operations, transformations on a given CT and DT signals.
2. Calculate the convolution between given CT & DT signals.
3. Represent the given periodic signal in terms of trigonometric Fourier series and obtain the Fourier transform of given periodic/ aperiodic signal.
4. Define sampling theorem & explain the effect of aliasing.
5. Given the impulse response or system transfer function of the LTI system to determine whether the system is stable & or causal or not.
6. Define correlation, spectral density & state their properties.

EN226. SOFTWARE SIMULATION TOOLS

At the end of course, students will be able to

1. Write program using different functions of MATLAB
2. Simulate different electronic circuits using MATLAB
3. Create simple models using SIMULINK blocks.
4. Describe system behavior using different analysis tools and functions of MATLAB and SIMULINK
5. Simulate different electronic circuits using OrCAD/PROTEUS

T.E. ELECTRONICS -I

EN311. CONTROL SYSTEMS

At the end of course, students will be able to

1. Classify control systems.
2. Represent the different electrical system mathematically.
3. Find transfer function of a system using signal flow graph and block diagram reduction methods.
4. Explain application of control system components to form a feedback control system.
5. Exhibit knowledge of stability, time and frequency domain analysis necessary to find systems performance.
6. Draw Root locus, Bode plot and Polar plot for a feedback control system which can be further analyzed to find its stability.
7. Decide the necessary compensation technique to stabilize systems performance.

EN312. DIGITAL SIGNAL PROCESSING

At the end of course, students will be able to

1. Analyze a given signal or system using tools such as Fourier transform and z-transform
2. Demonstrate knowledge of different transforms.
3. Draw the structure for realization of a given system.
4. Design IIR and FIR filters.
5. Demonstrate knowledge of basic blocks of a typical digital signal processor.

EN313. MICROPROCESSOR AND INTERFACING

At the end of course, students will be able to

1. Describe 8085 MPU, its peripherals and their various applications.
2. Write assembly program for different applications.
3. Design 8085 microprocessor based systems.

EN314. ELECTROMAGNETIC ENGINEERING

At the end of course, students will be able to

1. Solve numerical problems on coordinate systems, divergence, curl and gradient.
2. Derive basic laws of electrostatic and magnetostatic and can apply them for different fields.
3. Derive Maxwell's equations under different conditions and can derive wave equation from them
4. Describe and analyze electromagnetic wave propagation in different media.
5. Describe transmission lines and antennas

EN315. INFORMATION TECHNOLOGY AND MANAGEMENT

At the end of course, students will be able to

1. Be aware of changing face of business and importance of management information system for today's business
2. Describe features of digital commerce and is aware of social and ethical issues associated with new business practices.
3. Describe how companies can gain benefit of E-commerce to enhance business through examples and case studies.
4. Illustrate and apply software development life cycle and software models
5. Apply knowledge of project management process through case study and able to explain methods for monitoring and control of the project.

EN316. OBJECT ORIENTED PROGRAMMING WITH C++

At the end of course, students will be able to

1. Differentiate between C and C++ in terms of data hiding and class and can implement applications using programming with class.
2. Describe significance and implement different types of constructors. He can also explain the difference between a constructor and a destructor.
3. Implement the structure, types of inheritance and explain the importance of inheritance.
4. Implement types of polymorphism- compile type polymorphism, run type polymorphism and virtual function.
5. Use different features of OOP's for efficient programming.

EN317. OPERATING SYSTEMS

At the end of course, students will be able to

1. Identify and describe structure, operations of operating system and its different types.
2. Design & describe different operations on process, thread implementation, scheduling techniques, synchronization algorithms and also their performance analysis.
3. Design & describe deadlock condition and methods to overcome deadlock.
4. Demonstrate file systems, directories and its different terms.
5. Analyze memory management system and its different aspects.
6. Handle I/O sub system.

T.E. Electronics -II

EN321. DIGITAL COMMUNICATION

At the end of course, students will be able to

1. Identify and describe different blocks of a pulse and digital communication systems with relevance.
2. Describe different carrier modulation and detection techniques along with their performance analysis.
3. Analyze theoretical bounds on the rates of digital communication systems.
4. Solve numerical problems based upon source coding and channel coding techniques.

EN322. MICROCONTROLLERS

At the end of course, students will be able to

1. Describe architecture of 8051 and PIC 16F877 microcontrollers and their various applications
2. Write assembly and C program for different applications.
3. Develop a simple microcontroller based system for different applications.

EN323. INDUSTRIAL ELECTRONICS

At the end of course, students will be able to

1. Explain the characteristics of power semiconductor devices and identify suitable switching device for given application.
2. Analyze and design power electronics applications such as controlled rectifiers, switched mode power supplies and stabilizers.
3. Develop control scheme for single phase converters using microcontroller
4. Design various firing circuits for power devices.
5. Describe importance and develops control schemes for converters using suitable microcontroller.
6. Select appropriate power devices for conversion, control and conditioning of power
7. Select power devices and firing circuits for special application to industrial processes.

EN324. VLSI DESIGN

At the end of course, students will be able to

1. Use VHDL language for modeling with all its features
2. Write VHDL code for modeling combinational and sequential circuits.
3. Describe the architecture of CPLD and FPGA and to implement some functions in FPGA.
4. Implement digital functions using CMOS logic and gates.
5. Design the minimal test set required for testing the circuits.

EN325. MINI HARDWARE PROJECT

At the end of course, students will be able to

1. Select an appropriate project in applied area
2. Design circuit, select and test required components
3. Use modern software tools for PCB designing and circuit simulation
4. Test completed circuit / project
5. Write technical report of the project
6. Estimate costing of the project and also demonstrates social and safety aspects associated with project
7. Complete project in a team with proper sharing of responsibilities and work

EN326. TECHNICAL SELF LEARNING MODULE- I: ROBOTICS

At the end of course, students will be able to

1. Describe the concepts of robotics.
2. Analyze different control methods of robot and end effectors
3. Become aware about different sensors and can integrate the robot system.
4. Describe different control scheme and types of mobile robots
5. Express fundamentals of robotic vision
6. Get acquainted with current and future scope of industrial robotics applications.
7. Develop innovative atomized robots.

EN327. TECHNICAL SELF LEARNING MODULE II: PROGRAMMING IN VISUAL BASIC.NET

At the end of course, students will be able to

1. Implement object oriented concepts in programming.
2. Create form for specific application
3. Access external application using serial communication.

EN328. TECHNICAL SELF LEARNING MODULE III: AUTOMOTIVE ELECTRONICS

At the end of course, students will be able to

1. Describe basics of working of automobile engines and transmission
2. Get acquainted with different electronic circuits used in automobiles
3. Describe communication and diagnostic systems used in automobiles
4. Realize importance of environmental friendly vehicles

EN329. TECHNICAL SELF LEARNING MODULE IV: ELECTRONIC INSTRUMENTATION

At the end of course, students will be able to

1. Identify type of errors occurring in measuring instruments.
2. Convert measuring quantity into different standard units.
3. Describe various shielding methods for reducing signal interference.
4. Describe designing aspects for electronic counters, measuring meters of different ranges.
5. Select proper transducers, recorders to assemble a measuring instrument for different applications.
6. Identify different sensors and explain interfacing circuits for these.
7. explain data acquisition system for various applications

B.E. ELECTRONICS -I

EN411. POWER ELECTRONICS

At the end of course, students will be able to

1. Analyze and design power electronics applications such as controlled rectifiers, choppers, inverters and cycloconverters.
2. Formulate and calculate power consumption by understanding converter and commutation specifications
3. Describe control schemes for three phase converters using suitable microcontroller.
4. Describe operation principles and circuit topologies of various chopper commutation circuits and select it for suitable application.
5. Describe voltage control of inverter using different harmonic reduction and PWM reduction techniques
6. Describe power electronics applications to control AC and DC drives.
7. Describe the operation principle and characteristics of various power electronics drive systems
8. Describe different power factor controlling techniques.

EN412. COMPUTER NETWORKS

At the end of course, students will be able to

1. Describe types of data communication and their performance parameters.
2. Describe benefits of layered model approach, able to select appropriate network device and network topology for the given application.
3. Create IEEE 802.3 LAN and provide different services to the users.
4. Implement basic network programming to start server –client communication and various other services.

EN413. MOBILE TECHNOLOGY

At the end of course, students will be able to

1. Give details for design challenges for wireless and mobile system development.
2. Describe frequency reuse concept and can apply different techniques for improving coverage and capacity

3. Describe 3G GSM in detail with architecture, protocol, signal processing and security
4. Evaluate CDAMA technique and can describe IS 95 block diagram and channels
5. Describe IEEE 802.11 and Bluetooth with architecture and protocol
6. Explain mobile TCP/IP

EN414. ELECTRONIC SYSTEM DESIGN

At the end of course, students will be able to

1. Describe complete electronic product design process as a big picture
2. Analyze and design analog circuits which constitutes to final system design of an electronic product
3. Analyze and design digital circuits which constitutes to final system design of an electronic product
4. Implement software design, testing and debugging process for final year project
5. Develop various technical documents for final year project
6. Prepare and deliver progress presentations and closure presentation at various stages of final year project

EN415. ELECTIVE-I

A. BIOMEDICAL INSTRUMENTATION

At the end of course, students will be able to

1. Analyze bio electrical signals from various parts of body
2. Decide appropriate sensor and necessary instrumentation for physiological parameter measurement
3. Explain working of basic medical equipments
4. Plan for protection to biomedical instrument against electrical shocks.

B. MECHATRONICS

At the end of course, students will be able to

1. Analyze different types of controllers
2. Explain principles and drive techniques for DC motors
3. Design programmable motion controllers
4. Describe precision mechanical actuation
5. Explain the operation, principle and characteristics of MEMS.
6. Analyze the mechatronic system as a whole
7. Analyze robot and its peripherals

C. IMAGE PROCESSING

At the end of course, students will be able to

1. Describe various application areas and applications of image processing
2. Describe and derive for low level operations in spatial and frequency domain
3. Write MATLAB® programs for few basic image processing operations in spatial and frequency domain
4. Describe and derive for image analysis and description operations
5. Explain different image compression techniques
6. Decide to take up project in image processing / computer vision

EN416. PROJECT

At the end of course, students will be able to

1. Select a suitable project based upon requirement analysis and literature survey
2. Plan for management and financial aspects of the project
3. Design hardware and software architecture of the project
4. Apply design concepts for detail design of project
5. Validate the results and can also analyze them
6. Demonstrate leadership and team working behavioral skills
7. Write synopsis and project report
8. Demonstrate presentation skills

9. Use programming / simulation software and presentation, word processing software at various stages of project

EN417. VOCATIONAL TRAINING

At the end of course, students will be able to

1. Undertake suitable project based on the learning in vocational training and successfully completes it.
2. Write vocational training report
3. Demonstrate presentation skills
4. Use programming / simulation software and presentation , word processing software at various stages of project

B.E. ELECTRONICS -II

EN421. ADVANCED COMMUNICATION ENGINEERING

At the end of course, students will be able to

1. Compare radio frequency and microwave frequency communication with respect to devices, working principle and applications.
2. Explain different radar systems
3. Describe satellite subsystem and earth station block diagram with their working principle.
4. Apply different modulation techniques and access techniques for wireless communications
5. Deign radio link models and analyze link budget for satellite.
6. Apply ray theory for optical communication.

EN422. AUDIO VIDEO SYSTEMS

At the end of course, students will be able to

1. Describe basic components of multimedia.
2. Explain and relate audio-video standards based on different applications.
3. Identify and analyze various elements of composite video signal.
4. Analyze amplitude and frequency of colour composite video signal such as burst cycles, spectrum of bar pattern, etc.
5. Explain block diagram of NTSC, PAL and SECAM TV systems.
6. Design receiver antenna section of a TV system.
7. Describe functional blocks of digital television, high definition television, satellite television and cable television systems.

EN423. EMBEDDED SYSTEMS

At the end of course, students will be able to

1. Portray hardware and software architecture of an embedded system.
2. Describe ARM7 core architecture
3. Describe LPC2148 architecture
4. Write assembly and C program for different applications for LPC2148

5. Interface (design hardware and write software) for interfacing different peripherals with LPC2148
6. Apply concepts of Real Time Operating System to organize embedded system.
7. Develop (design hardware and write software) LPC2148 based systems for simple applications

EN424. ELECTIVE-II

A. BROADBAND COMMUNICATION

At the end of course, students will be able to

1. Analyze and plan for different communication parameters to achieve high speeds in communication.
2. Explain usage of different present networks for high speed communication.
3. Analyze different protocols to utilize available networks with high efficiency.
4. Implement different protocols for fixed and adhoc wireless broadband access.

B. SPEECH PROCESSING

At the end of course, students will be able to

1. Describe need of different speech processing operations and can list applications for each
2. Express the speech signal in terms of its time and frequency domain representations and the different ways in which it can be modeled.
3. Analyze simple features used in speech classification applications.
4. Implement simple speech processing operations like speaker recognition using MATLAB®

C. PLC & INDUSTRIAL CONTROLLERS

At the end of course, students will be able to

1. Identify applications for PLC
2. Identify the basic components of the PLC and explain how they function
3. Write and debug ladder diagrams for PLC applications
4. Establish communication through interfacing with PLC
5. Explain PID controllers with necessary mathematical background and can also describe its tuning control

6. Describe the operation principle and characteristics of various sensors and actuating systems for electromechanical applications
7. Design signal conditioning circuits for interfacing various sensors and actuating systems

EN425. PROJECT

At the end of course, students will be able to

1. Select a suitable project based upon requirement analysis and literature survey
2. Plan for management and financial aspects of the project
3. Design hardware and software architecture of the project
4. Apply design concepts for detail design of project
5. Validate the results and can also analyze them
6. Demonstrate leadership and team working behavioral skills
7. Write synopsis and project report
8. Demonstrate presentation skills
9. Use programming / simulation software and presentation, word processing software at various stages of project

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

S.E.E&TC -I

T211. ENGINEERING MATHEMATICS-III

At the end of course, students will be able to

1. Solve higher order linear differential equation related to electrical circuit theory
2. Apply Laplace and inverse Laplace transforms for analysis of simple electrical circuits
3. Express a function in terms of sine's and cosines components so as to model simple periodic functions.
4. Solve problems on Z transform and explain its properties
5. Find the relation between two variables for the given data using regression
6. Sketch and explain various probability distribution functions
7. Solve simultaneous linear equations and nonlinear equations.
8. Solve the problems of Fourier integral and Fourier transform

ET212. ELECTRONIC CIRCUIT ANALYSIS AND DESIGN-I

At the end of course, students will be able to

1. Elaborate working and applications of diode.
2. Analyze and design unregulated power supply using diode
3. Elaborate working and characteristics of BJT.
4. Analyze and design single stage amplifier and multivibrator.
5. Evaluate FET and MOSFET parameters.
6. Explain applications of FET and MOSFET

ET213. NETWORK THEORY AND ANALYSIS

At the end of course, students will be able to

1. Analyze linear circuit with use of different network theorems and analysis methods.
2. Compute two port network parameters and draw equivalent network.
3. Determine transient and steady state response of linear circuits.
4. Design passive filter and attenuator circuits.