



SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

ALL BRANCHES

Course Outcomes

First Year B.Tech. (All Branches)

w.e.f. Academic Year 2020-21

- **C011 Engineering Physics**

C011.1	Describe the concepts of semiconducting material and crystal structure.
C011.2	Apply basic concepts of acoustics and ultrasonic in engineering field.
C011.3	Relate space, time, mass and energy equations.
C011.4	Express the concepts of diffraction, polarization and can relate them to day to day observable phenomena.
C011.5	Explain the fundamental concepts, advantages and applications of laser and optical fiber in the field of science, engineering and medical.
C011.6	Express the basic concepts of quantum mechanics and nanotechnology.

- **C012 Engineering Chemistry**

C012.1	Describe importance of quality of water and appropriate water treatment process.
C012.2	Recognize various types of corrosion & propose a suitable prevention technique.
C012.3	Describe various instrumental techniques.
C012.4	Identify and explain different engineering materials like metals, ceramics, fuels, lubricants, polymers for various engineering and day to day applications.
C012.5	Calculate hardness of water, concentration of unknown solution, calorific value of fuels, saponification & acid value of oils, molecular weight of polymers etc.
C012.6	Describe various types of energy storage systems with their applications.

- **C112 Engineering Mathematics**

C112.1	Student can compute higher order derivative of standard functions and verify Mean Value Theorems.
C112.2	Student can describe the power series expansion of a given function and evaluate limits
C112.3	Students are able to apply matrices techniques for solving system simultaneous linear equations , Eigen values and Eigen vectors of the matrix
C112.4	Student can evaluate Multivariable derivatives and can implement to estimate maxima and minima of multivariable function
C112.5	Students can compute velocity vector, gradient, divergence, curl and applications.

- **C113 Basics of Civil and Mechanical Engineering**

C113.1	Student will be able to describe the role of civil engineer in the development and the relevance of civil engineering knowledge with the other branches of engineering and technology.
C113.2	Student will be able to carry out simple surveys like measurement of distances, elevations and angles using traditional and modern surveying instruments, as well as they will be conversant with the Remote sensing, GIS and GPS Techniques.
C113.3	Student will be able to explain various concepts of Environment & Water resources management, Transportation engineering, Buildings elements and Green Buildings.
C113.4	Student will be able to determine the heat and work quantum in thermodynamic processes.
C113.5	Student will be able to distinguish between 2-stroke and 4-stroke I.C. engines.
C113.6	Student will be able to distinguish and select the type of power plants and power producing/absorbing systems.

- **C114 Engineering Mechanics**

C114.1	Apply fundamentals of Engineering Mechanics for analyzing effects of a system forces acting on a rigid body.
C114.2	Analyze various types of statically determinate beams, pin jointed trusses by analytical and graphical methods.
C114.3	Locate centroid and centre of Gravity and calculate moment of Inertia of plane lamina.
C114.4	Apply knowledge of Kinematics and Kinetics of rigid body motion to solve problems of bodies in motion.
C114.5	Use Work Energy methods for analyzing linear and rotational motion.

- **C115 Universal Human Values**

C115.1	Students can appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
C115.2	Students can develop holistic perspective towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence.
C115.3	Students can appreciate the Universal Human Values and movement towards value-based living in a natural way.
C115.4	Students can Highlight ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

C116 Communication Skills

C116.1	Student can frame grammatically correct sentences for day to day communication
C116.2	Student can use numerous appropriate words and sentences in written communication.
C116.3	Student can demonstrate effective oral communication skills in various situations.
C116.4	Student can read, comprehend and answer the questions based on a passage.
C116.5	Student can draft letters, emails, write paragraphs and essays with appropriate content and context.
C116.6	Students are able to solve verbal ability questions in competitive exams

- **C117 Creativity And Design Thinking**

C117.1	Students can relate with and Compare the various learning styles and memory techniques and Apply them in their engineering education.
C117.2	Students can analyze emotional experience and Experiment with emotional expressivity to better understand users while designing products.
C117.3	Students can appreciate the importance creativity and design thinking, Develop new ways of thinking and Learn the innovation cycle for creating innovative products.
C117.4	Students can understand individual differences and its impact on everyday decisions so as to demonstrate frameworks, strategies, techniques while creating innovative products.
C117.5	Students can develop skills for evaluating, articulating, refining, and creating an innovative engineering product that solves customer problems(s).

- **C118 Workshop Practice**

C118.1	Student can identify various hardware and software components of a computer and compare between them.
C118.2	Student can assemble a desktop from components supplied and Setup a working desktop system using a Raspberry Pi board.
C118.3	Student can identify and use various electronic components and instruments.
C118.4	Student can develop basic electronic circuits on breadboards.
C118.5	Student can demonstrate the use of an Arduino board using basic circuits.
C118.6	Student can prepare different shaped metal work piece joints from the given metal blanks by selecting different tools and machines.
C118.7	Student can perform different types of welding of metal components.
C118.8	Student can select different engineering tools required to perform, fitting, machining, welding and joining processes.

- **C122 Engineering Mathematics II**

C122.1	Solve first order ordinary differential equation and able to apply in different engineering applications
C122.2	Test divergence & convergence of infinite series
C122.3	Use the tools of differentiation of functions of a complex variable that are used in various techniques dealing engineering problems.
C122.4	Draw approximate shape of planer curve with justification.
C122.5	Evaluate improper and multiple integrals and their usage.

- **C123 Basic Electrical and Electronics Engineering**

C123.1	Student can apply the various simplification methods to analyze dc circuits.
C123.2	Student can use the concept of magnetic circuits to calculate parameters of magnetic circuits and single phase transformer
C123.3	Student can apply knowledge of ac fundamentals to analyze series ac circuits.
C123.4	Explain working, characteristics and applications of diode and BJT.
C123.5	Select appropriate transducers to measure various physical parameters like distance, temperature etc.
C123.6	Perform arithmetic operations on digital number system.

- **C124 Programming for Problem Solving**

C124.1	Design the flowcharts and algorithms for the given problem
C124.2	Translate the algorithms into C programs and test & execute the programs.
C124.3	Implement C programs by appropriately selecting control and loop structures.
C124.4	Implement C programs using functions and pointers.
C124.5	Implement C programs using arrays, structure and unions
C124.6	Develop small applications using C Programming concepts

- **C125 Engineering Graphics and CAD**

C125.1	Draw projection of lines and planes for engineering applications
C125.2	Draw regular and sectional views of various types of solids
C125.3	Draw the 2 D view (orthogonal views) given 3D drawing
C125.4	Draw the development of the regular and truncated solids
C125.5	Draft the 2-D drawing of machine components.

- **C126 Professional Communication**

C126.1	Prepare good quality presentation and deliver it effectively.
C126.2	Participate effectively in group discussion
C126.3	Perform effectively in personal interview
C126.4	Prepare effective resume for job interviews
C126.5	Draft and write various reports professionally.
C126.6	Demonstrate various soft skills like team skills, leadership, creativity, etc. in different situations.



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Course Outcomes

S.Y. B.Tech (Electronics Engineering)

w.e.f. Academic Year 2019-20

- **EN211 Engineering Mathematics III**

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

- **EN212 Electronic Circuit Analysis and Design**

1. Student can analyze wave shaping circuits and voltage multipliers
2. Student can analyze and design unregulated power supply using different filter circuit.
3. Student can elaborate working, characteristics and hybrid model of BJT
4. Student can analyze and design single stage amplifier.
5. Student can design and analyze feedback amplifiers.
6. Student can describe construction ,working & drain characteristics of JFET and MOSFET

- **EN213 Network theory and Analysis**

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

- **EN214 Digital Logic Design**

1. Student can illustrate underlying concepts of digital logic circuits and their applications.
2. Student can use logic gates knowledge to analyze and design a logic circuit.
3. Student can realize different logic families along with their vital parameters.
4. Student can design combinational and sequential circuits
5. Student can use concept of synchronous state machine for solving design problems.
6. Student can use programmable logic devices for designing logic circuits

- **EN215 Analog Communication**

1. Student can describe basic components of communication system and examine the needs of Modulation.
2. Student can describe concept of noise and also recognizes its effects.
3. Student can describe amplitude modulation and demodulation and analyze the signals in time and frequency domain.
4. Student can describe frequency modulation and demodulation and analyze the signals in time and frequency domain.
5. Student can describe the process of pulse modulation & classify its types.
6. Student can examine behavior of wave propagation and basic principle of different antenna.
7. Student can simulate components of communication system using simulation software and can interpret results.

- **EN216 Object Oriented Programming with C++**

1. Student can differentiate between C and C++ in terms of data hiding and class. He can also implement programs using class.
2. Student can describe significance and implement different types of constructors and destructors
3. Student can implement structure, types of inheritance and explain importance of inheritance.
4. Student can use function overloading and operator overloading to implement compile time polymorphism
5. Student can use virtual functions to implement run time polymorphism
6. Student can use different features of object oriented programming efficiently

- **EN221 Electrical Machines**

1. Students can describe working principle, types and characteristics of dc generator.
2. Students can explain working, speed control, starting and braking of dc motors and three - phase induction motors.
3. Students can elaborate three phase power measurement and power factor improvement methods.
4. Students can explain working, types of starters and speed control of three - phase induction motor and can derive the torque equation.
5. Students can describe working and application of different single phase special motors.
6. Students can elaborate three phase transformer connections.

- **EN222 Control Systems**

1. Student is able to determine system transfer function using block diagram reduction method, signal flow graph method.
2. Student is able to derive transfer function of armature controlled and field controlled DC motor.
3. Student can analyze step and impulse response of first & second order system.
4. Student can apply different methods to determine the system stability
5. Student can analyze system performance using frequency domain analysis
6. Student can explain different compensation techniques and controllers

- **EN223 Data Structures**

1. Student can implement stack and queues.
2. Student can describe the significance and implement different types of linked lists
3. Student can describe the significance of recursion and can use recursion efficiently
4. Student can implement different searching and sorting technique and can compare different techniques in terms of time complexity
5. Student can describe different types of binary trees and can implement different tree traversal methods
6. Student can illustrate different graph representation and traversal methods

- **EN224 Analog Integrated Circuits**

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

- **EN225 Signals and Systems**

1. Student is able to sketch & label signals, perform arithmetic operations, transformations on a given continuous time (CT) and discrete Time (DT) signals..
2. Student can develop input output relationship for linear time invariant system and compute the convolution between given CT & DT signals..
3. Student is able to understand and resolve the signals in frequency domain using Fourier series and Fourier transform.
4. To make student understand the process of sampling and the effects of under sampling..
5. Student is able to apply the Laplace transform and Z- transform for analysis of continuous-time signals and systems.
6. Student is able to define correlation, spectral density & state their properties.

- **EN226 Software Simulation Tools**

1. Student is able to solve simple matrix manipulation problems by writing functions in MATLAB
 2. Student is able to solve problems of DC circuit analysis using MATLAB
 3. Student is able to create simple models for rectifiers and resonance circuits using SIMULINK blocks.
 4. Student is able to demonstrate visualized behavior of various amplifiers and OP-AMP circuits using functionalities of MATLAB and SIMULINK
 5. Student is able to simulate simple electronic circuits involving diodes, transistors etc. using OrCAD/PROTEUS
 6. Student is able to create a small project-based simulation consisting of simple electronic circuits involving diodes, transistors etc.
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Course Outcomes

T.Y. B.Tech (Electronics Engineering)

w.e.f. Academic Year 2020-21

- **EN311 Digital Communications**

1. Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
2. Represent the time and frequency domain signals in a digital communication system.
3. Explain probability, random variable and various statistical analysis methods & derive channel capacity for discrete memory less channel and continuous channel.
4. Explain noise as a random process and its effect on communication receivers.
5. Calculate the performance of different source coding and channel coding schemes for the reliable transmission of digital signals and information over the channel
6. Evaluate techniques of spread spectrum communication system.

- **EN312 Digital Signal Processing**

1. Analyze a given signal or system using tools such as Fourier transform and z-transform
2. Apply properties of Discrete Fourier Transform and to determine the discrete Fourier transform, Inverse discrete Fourier transform by direct computation & Fast Fourier Transform algorithm.
3. Draw the structure for realization of a given system.
4. Design IIR and FIR filters.
5. Describe basic building blocks of digital signal processor.

- **EN313 Microcontrollers**

1. Student can describe architecture of 8051 and PIC 16F877 microcontrollers.
2. Student can write assembly language program for different applications with 8051 and PIC 16F877 microcontrollers.
3. Student can write “C” program for different applications with 8051 microcontroller.
4. Student can develop the system for different applications using 8051 microcontrollers.
5. Student can write programs for PIC 16F877 on chip peripherals for different applications.
6. Student can describe working of serial communication protocols RS232, SPI and I2C.

- **EN314 Electromagnetic Engineering**

1. Student can solve numerical problems on coordinate systems, divergence, curl and gradient.
2. Student can derive laws of governing electromagnetic fields and can apply them for different fields.
3. Student can determine electromagnetic force extended on charge particles, current elements, working principle of various electromagnetic energy conservation devices based on this forces
4. Student can derive Maxwell’s equations under different conditions
5. Student can deduce and justify electromagnetic wave propagation in different media.
6. Student can apply Maxwell’s equation to problems related to transmission lines and describe radiating system concepts and power flow with focus on antennas

- **EN315 Information Technology and Management**

1. Student can present case studies about changing face of business and importance of management information system for today's business
2. Student can explain different e-commerce mechanisms along with the examples
3. Student can describe necessity and benefits of data management for business and organizations
4. Student can present examples of primary and higher organizational applications of information system
5. Student can illustrate software development life cycle and can describe popular software models
6. Student can describe various social and ethical issues related to IT

- **EN316 Programming With Python**

1. Set up Python development environment and are able to write Python scripts
2. Employ core Python scripting elements such as variables and flow control structures
3. Use Python functions to facilitate code reuse
4. Evaluate how to work with lists, dictionaries, tuples and sets.
5. Implement concepts of object-oriented programming paradigm using Python to solve real world problems
6. Implement different data structures like linked lists, stack and queue using Python

- **EN321 Computer Networks**

1. Describe basic computer network technology, layered communication approach and OSI reference model.
2. Describe error control, flow control and other issues related to successful data communication
3. Recognize global standards related to LAN establishment and functioning of LAN, use of different networking devices to enhance scope of network.
4. Illustrate TCP/IP reference model, IPv4 addressing and other issues address translation.
5. Describe different routing issues and routing protocols
6. Describe client server model and establish communication in client server network

- **EN322 Embedded Systems**

1. Student can describe hardware and software architecture of embedded system.
2. Student can describe ARM7/TDMI core architecture
3. Student can write assembly and C program for different applications for microcontroller
4. Student can interface different peripherals with microcontroller..
5. Student can explain and use different services of real time operating system.

- **EN323 Electronic System Design**

1. Describe hardware and software design process and develop various technical documents
2. Design battery charger for LI-ION and Ni-MH batteries etc.
3. Design interfacing circuit for different sensors like temperature, pressure, Hall Effect and light sensors.
4. Use sensors, serial bus protocols like RS232, RS485, for system design with a practical approach.
5. Analyze the electronics systems like digital camera, smart card, smart attendance monitoring system
6. Design the PCB for simple electronic circuits

- **EN324 VLSI Design**

1. Explain VHDL features with suitable example
2. Write VHDL code & test bench for modeling and testing combinational and sequential circuits.
3. Elaborate steps in the high level design flow and implement some functions using CPLD/FPGA.
4. Explain the characteristics of CMOS and implement digital functions using CMOS logic and gates.
5. Describe the testing methods and design the minimal test set required for testing the circuits.

- **EN325 Operating Systems**

1. Identify and describe structure, operations and different types of operating system.
2. Describe the concept of process and inter process communication.
3. Analyze effect of different scheduling criteria on scheduling techniques.
4. Evaluate deadlock condition and implement methods to overcome deadlock
5. Analyze memory management concepts like logical and physical addressing
6. Make use of file systems, directories and different commands associated to it.

- **EN326.1 Robotics**

1. Student can describe the concepts of robotics.
2. Student is able to identify the major components of robot system.
3. Student can describe different control scheme and types of mobile robots
4. Student can compare different sensors and can integrate them into robot system.
5. Student can express fundamentals of robotic vision
6. Student can evaluate current and future scope of industrial robotics applications.

- **EN326.2 : Automotive Electronics**

1. Student can describe basics of working of automobile engines and transmission
2. Student can describe different electronic circuits used in automobiles
3. Student can describe communication and diagnostic systems used in automobiles
4. Student can evaluate importance of environmentally friendly vehicles

- **EN326.3 Electronic Instrumentation**

1. Student can identify type of errors occurring in measuring instruments.
2. Student is able to convert measuring quantity into different standard units.
3. Student can describe various shielding methods for reducing signal interference.
4. Student can describe designing aspects for electronic counters, measuring meters of different ranges.
5. Student can select proper transducers / sensors, recorders to assemble a measuring instrument for different applications.
6. Student can explain data acquisition system for various applications

- **EN326.4 Programming With JAVA**

1. Student can outline basics of core Java programming.
2. Student can employ the concept of classes and methods to solve real world problems.
3. Student can implement different types of inheritance and explain the importance of inheritance.
4. Student can choose an appropriate Java package for different programming tasks.

- **EN327 Mini Hardware Project**

1. Student can plan and execute a mini project with team.
 2. Student can device electronic hardware by implementing knowledge and skill of PCB
 3. design techniques, soldering techniques and hardware debugging techniques
 4. Student can prepare technical report based on the mini project
 5. Student can estimate cost of the mini project, deliver technical seminar over mini project.
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Course Outcomes

B.E. (Electronics Engineering)

w.e.f. Academic Year 2019-20

- **EN411 Power Electronics**

1. Student can analyze and design the three phase controlled rectifiers.
2. Student can analyze different types of choppers.
3. Student can analyze single phase and three phase cycloconverters.
4. Student can analyze single phase and three phase voltage source inverters.
5. Student can describe power electronics applications to control AC and DC drives.
6. Student can describe different power factor controlling techniques.

- **EN412 Computer Networks**

1. Student can describe basic computer network technology.
2. Student can describe benefits of layered model approach and enumerate layers of the OSI and TCP/IP reference model, explain the function(s) of each layer.
3. Student can identify different types of network devices and their functions within a network.
4. Student can establish IEEE 802.3 LAN and provide different services to the users.
5. Student can define subnetting and plan for routing mechanisms.
6. Student can describe basic protocols of computer networks, their implementation and techniques to enhance network performance

- **EN413 Mobile Technology**

1. Student can give details for design challenges for wireless and mobile system development.
2. Student can describe frequency reuse concept and can apply different techniques for improving coverage and capacity
3. Student can describe GSM in detail with architecture, protocol, signal processing and security
4. Student can evaluate CDAMA technique and can describe IS 95 block diagram and channels
5. Student can describe IEEE 802.11 and Bluetooth with architecture and protocol
6. Student can explain mobile TCP/IP

- **EN414 Internet of Things**

1. Student can elaborate different components of an IoT system.
2. Student can describe the architecture of ARM Cortex M3 series microcontroller
3. Student can write interfacing program for different applications with microcontroller
4. Student can describe different communication technologies used in IoT.
5. Student can illustrate MQTT & CoAP application protocols.
6. Student can elaborate different cloud platforms of IoT.

- **EN415A Biomedical Instrumentation**

1. Student can analyze bio electrical signals from various parts of body
2. Student can decide appropriate sensor and necessary instrumentation for physiological parameter measurement
3. Student can identify common signal artifacts, their sources and formulate strategies for their suppression
4. Student can outline the design of instrumentation amplifier, cardiac pacemakers and defibrillators
5. Student is able to explain working of basic medical equipments
6. Student is able to plan for protection to biomedical instrument against electrical shocks.

- **EN415B Mechatronics**

1. Student can elaborate basic concept and analyze key elements of mechatronics system.
2. Student can explain principles of different sensors and transducers.
3. Student can illustrate pneumatic and hydraulic actuation system.
4. Student can describe mechanical actuation system
5. Student can illustrate the operation, principle and characteristics of MEMS.
6. Student can analyze the mechatronic system as a whole.

- **EN415C Image Processing**

1. Student is able to enlist various application areas and applications of image processing
2. Student is able to express low level operations in spatial and frequency domain
3. Student is able to describe and derive for image analysis operations
4. Student is able to differentiate between image representation & description operations
5. Student is able to illustrate advantages of transform-domain processing over spatial domain
6. Student is able to compare different image compression techniques

- **EN415D Database Management Systems**

1. Student is able to enlist various advantages of using database management systems.
2. Student is able to define a data model, distinguish its categories and describe three schema architecture
3. Student is able to describe classification of database management systems.
4. Student is able to differentiate between model & relational data model
5. Student is able to illustrate basic retrieval queries used in SQL
6. Student is able to describe distributed database systems and their types

- **EN416 Project I**

1. Student can select a suitable project based upon requirement analysis and literature survey
2. Student can plan for management and financial aspects of the project
3. Student can design hardware and software architecture of the project
4. Student can apply design concepts for detail design of project
5. Student can validate the results and can also analyze them
6. Student demonstrates leadership and team working behavioral skills
7. Student can write synopsis and project report
8. Student demonstrates presentation skills
9. Student can use programming / simulation software and presentation, word processing software at various stages of project

- **EN417 Vocational Training**

1. Student undertakes suitable project based on the learning in vocational training and successfully completes it.
2. Student can write vocational training report
3. Student demonstrates presentation skills
4. Student can use programming / simulation software and presentation , word processing software at various stages of project

- **EN421 Advanced Communication Engineering**

1. Student is able to compare radio frequency and microwave frequency communication with respect to devices, working principle and applications.
2. Student is able describe microwave devices with its working principle, mathematical analysis and its applications.
3. Student is able to explain different radar systems
4. Student is able to describe satellite subsystem and earth station block diagram with their working principle.
5. Student is able to apply different modulation techniques and access techniques for wireless communications
6. Student is able to design radio link models and analyze link budget for satellite.
7. Student is able to apply ray theory for optical communication.

- **EN422 Audio Video Systems**

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

- **EN423 Electronic System Design**

1. Student can design various power supply like DC power supply, SMPS, emitter follower regulator etc.
2. Student can design different multivibrator circuits using IC555, ON/OFF, PI, and PID controllers.
3. Student can use sensors, serial bus protocols like RS232, RS485, sequential circuits for system design with a practical approach.
4. Student can analyze and design analog and digital circuits which constitutes to final system design of an electronic product.
5. Student can implement software design, testing and debugging process for final year project.
6. Student can develop various technical documents for final year project.
7. Student can design the PCB for electronic circuits.

- **EN424A Broadband Communication**

1. Student is able to analyze appropriate data communication network architecture for given application
2. Student is able to illustrate different techniques to supports narrowband and broadband services
3. Student is able to define broadband services and specify their applications in modern communication networks
4. Student is able to reveal broadband packet switching technologies and networks
5. Student is able to describe different protocols to utilize available networks with high efficiency.
6. Student is able to interpret ATM switching mechanisms for broadband networks

- **EN424B PLC and Industrial Controllers**

1. Student can identify applications for PLC
2. Student can identify the basic components of the PLC and explain how they function
3. Able to write and debug ladder diagrams for PLC applications
4. Student can establish communication through interfacing with PLC
5. Student can explain PID controllers with necessary mathematical background and can also describe its tuning control
6. Student can describe the operation principle and characteristics of various sensors and actuating systems for electromechanical applications
7. Student can design signal conditioning circuits for interfacing various sensors and actuating systems

- **EN424C Speech Processing**

1. Can describe need of different speech processing operations and can list applications for each
2. Student can express the speech signal in terms of its time and frequency domain representations and the different ways in which it can be modeled.
3. Student can analyze simple features used in speech classification applications.
4. Student can implement simple speech processing operations like speaker recognition using MATLAB

- **EN424D Data Analytics**

1. Student is able to illustrate various attribute types and basic statistical measures used to describe the central tendency and dispersion (spread) of attribute data.
2. Student is able to analyze the methods used for *data* cleaning, integration, reduction and transformation
3. Student is able to describe the role of feature extraction and data type portability for data preparation.
4. Student is able to list out the strategies used for data reduction and data transformation
5. Student is able to describe dimensionality reduction using axis rotation and type transformation
6. Student is able to illustrate data cube and OLAP concepts of data warehouse modeling

- **EN425 Project II**

1. Student can select a suitable project based upon requirement analysis and literature survey
 2. Student can plan for management and financial aspects of the project
 3. Student can design hardware and software architecture of the project
 4. Student can apply design concepts for detail design of project
 5. Student can validate the results and can also analyze them
 6. Student demonstrates leadership and team working behavioral skills
 7. Student can write synopsis and project report
 8. Student demonstrates presentation skills
 9. Student can use programming / simulation software and presentation, word processing software at various stages of project
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