Curriculum

For
Bachelor of Engineering
( Electronics and Computer Engineering )
( Choice Based Credit System )
( With Effect from Academic Year 2020-21 )
Savitribai Phule Pune University
Faculty of Science & Technology

Proposed curriculum
For
BE (Electronics & Computer Engineering)
(Choice Based Credit System)
(With Effect from Academic Year 2023-24)
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**Abbreviations:**

- TH: Theory
- TW: Term Work
- OR: Oral
- PR: Practical
- TUT: Tutorial

**Note:** Interested students of B.E. (Electronics/E&TC/Electronics & Computer) can opt any one of the audit course from the list of audit courses prescribed by BoS (E & T Engineering)

*Elective-I*  
1. Embedded System and RTOS  
2. VLSI Design  
3. Information and Cyber Security  
4. Digital Image Processing

*Elective-II*  
1. Mobile Communication  
2. Robotics and Automation  
3. Software Testing and Quality Assurance  
4. Artificial Intelligence and Machine Learning
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**#Elective-III**

1. Electronics System Design
2. Optical Fiber Communication
3. Data Mining and Ware Housing
4. Human Computer Interface

**##Elective-IV**

1. Software Defined Radio
2. Wireless Sensor Network
3. Design and Analysis of Algorithm
4. Software Engineering
5. Open Elective
SEMESTER – I

Advanced Techniques for Electrical Vehicle

Teaching Scheme:
Lectures: 3 Hrs/ Week

Examination Scheme:
In Semester Examination: Phase I: 30
End Semester Examination: Phase II: 70

Course Contents:

Unit I: Basics of EV
6L
History of EV, Types of EVs, Block diagram and working Principle of EV, Major Components of EV, Advantages of EV over other vehicles, Limitations of EV.

Unit II: Components and their functions of EV
6L
Major Electric/Electronic Components and their function, Major Mechanical (Mechatronics) Components and their function, Parameters consideration before design EV, Selection criteria of the component while designing the EV, Standards required as per AIS norms

Unit III: Drive train system
6L
Types of Motors and its working principles of EV, Function of Controllers and their use EV drives, Types of Sensors and their functions, Functional block diagram of each stage in brief, Scope of Development of EV drive system

Unit IV: Battery Technologies
6L
Traditional battery system, Current battery and their function, Function of batteries in EV, Battery parameter, Battery Management System (BMS), Comparison of Batteries and scope of development, Upcoming technologies in battery.

Unit V: Charging Infrastructure
6L
Basics of charging and Infrastructure, Types of charging and its function, Points to be considered in design of charger, Types of chargers and working principles, Sources and utilization of renewable, energy for charging.

Unit VI: Challenges in EV and Solutions
6L
Charging and Infrastructure issues, Troubles shootings in drive trains, troubleshooting in batteries, Maintenances of EVs, Safety and precaution for EVs

Books:
Internet of Things

Teaching Scheme:
Lectures: 3 Hrs/ Week

Examination Scheme:
In Semester Examination: Phase I: 30
End Semester Examination: Phase II: 70

Course Objectives:
- Introduction to different aspects of the IoT, including end devices, networks, programming, and security and privacy implications.
- Understand what constitutes an IoT design solution.
- To learn real world application scenarios of IoT along with its societal and economic impact using case studies.

Course Outcomes:
After successfully completing the course students will be able to
1. Discover key IoT concepts including identification, sensors, localization, wireless protocols, data storage and security.
2. Explore IoT technologies, architectures, standards, and regulation.
3. Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices.
4. Examine technological developments that will likely shape the industrial landscape in the future.
5. Develop and implement IoT solutions and applications.

Course Contents:

Unit I: Fundamentals of IOT

Unit II: IoT Protocols and Security

Unit III: WSN & Cloud Computing
WSN: introduction to WSN technology, Basic components of WSN, Characteristic features of WSNs, challenges, Application of WSN in: smart homes, healthcare, intelligent transportation, agriculture, etc. Cloud Computing: Cloud architecture standards and interoperability, Business concerns in the cloud, characteristics, Cloud types; IaaS, PaaS, SaaS, Public cloud, Private cloud, Benefits and challenges of
cloud computing, Development environments for service development: Amazon, Azure, Thingspeak, Google App-cloud platform in industry.

**Unit IV: Implementation of IoT**

Implementation of IoT with Arduino: Introduction to arduino, arduino board overview, Programming environment, Simple assignments using arduino, Sending data to Cloud, analysis using any IoT platform Introduction to Raspberry Pi, Raspberry Pi board overview, Programming environment, introduction to python programming, Simple assignments using Raspberry Pi, Sending data to cloud, analysis of data using any IoT platform.

**Unit V: Big Data - Data Storage and Analytics**

What is Big Data (BD), Modern Corporate need of BD Strategy, Main components of Big Data Solution, Basic Architecture of BD Solution, Introduction to Hadoop, Prototyping with any development board Data Analytics: Types of data analytics, Using Cloud Services to visualize live Data Streams. Data analytics using any platform like Amazon, Azure, Thingspeak or any other open source platform

**Unit VI: Technological Aggregation & Case Studies**

Modern trends in IOT: Wearable, industrial standards, Open Data Management & API. Case studies, connected use cases in Real-life/Thematic areas – Smart Homes/Buildings, Smart Cities, Smart Industry, Smart Medical care, Smart Automation etc.

**Text Book:**
1. Arshdeep Bahga, Vijay Madisetti, Internet of Things, A hands-on approach, Universities Press

**Reference Book:**
Teaching Scheme:  
Lectures: 3 Hrs/ Week

Examination Scheme:  
In Semester Examination: Phase I: 30  
End Semester Examination: Phase II: 70

Embedded System and RTOS

Course Objectives:

- To understand the embedded system design issues.
- To learn real time operating system concepts.
- To understand the Embedded Linux environment.
- To learn embedded software development and testing process.

Course Outcomes:

After successfully completing the course students will be able to

1. Get insight of design metrics of embedded systems to design real time applications to match recent trends in technology.
2. Understand Real time system concepts.
3. Understand Linux operating system and device drivers.
4. Get to know the hardware – software co-design issues and testing methodology for embedded system.

Course Contents:

Unit I: Introduction to Embedded Systems 6L

Unit II: Real Time Systems Concepts 6L
Foreground/ Background systems, Critical section of code, Resource, Shared resource, multitasking, Task, Context switch, Kernel, Scheduler, Non-Preemptive Kernel, Preemptive Kernel, Reentrancy, Round robin scheduling, Task Priorities, Static & Dynamic Priority, Priority Inversion, Assigning task priorities, Mutual Exclusion, Deadlock, Clock Tick, Memory requirements, Advantages & disadvantages of real time kernels.

Unit III: μCOS II 6L
Features of μCOS II. Kernel structure. μCOS II RTOS services: Task management, Time management, Intertask Communication and Synchronization.

Unit IV: Embedded Linux Development Environment 6L
Need of Linux, Embedded Linux Today, Open Source and the GPL, BIOS Versus Boot loader, Anatomy of an Embedded System, Storage Considerations, Embedded Linux Distributions. Embedded

Unit V: Linux Kernel Construction 6L

Unit VI: Embedded Software Development, Testing Process and Tools 6L

Text Books:

Reference Books:

List of Experiments:

Group A: ARM7/ ARM Cortex- M3 & μCOS - II Based Experiments (any four)
1. Multitasking in μCOS II RTOS using minimum 3 tasks on ARM7/ ARM Cortex- M3.
2. Semaphore as signaling & Synchronizing on ARM7/ ARM Cortex- M3.

Group B: ARM9 & LINUX Based Experiments (any four)
7. Writing simple application using embedded Linux on ARM9.
8. Writing “Hello World” device Driver. Loading into & removing from Kernel on ARM9 board.
9. Write a program for I2C based RTC using embedded Linux on ARM9.
10. Using Device driver for GPIO, write a program to blink LED onARM9.
11. Write a program for external interrupt on ARM9.

**Course Objectives:**

To understand CMOS technology and its application in VLSI Circuits.

- To design digital circuits using HDL.
- To implement digital circuits using FPGA.
- To design using CAD tools.

**Course Outcomes:**

After successfully completing the course students will be able to

2. Design advance digital circuit using HDL.
3. Understand the importance of CAD tools.

**Course Contents:**

**Unit I: Introduction to VLSI Circuits**


**Unit II: Digital Circuit Design and testing using HDL**

Module, Entity, Architecture, Modelling styles, Design of sequential circuits, asynchronous and synchronous design issues, state machine modelling (Moore and Mealy machines), attributes, Generics, Basic test benches, Test bench structure, constrained random stimulus generation.

**Unit III: CMOS Subsystem Design**

Semiconductor memories, memory chip organization, Random Access Memories (RAM), Static RAM (SRAM), standard architecture, 6T cell, sense amplifier, address decoders, timings. Dynamic RAM (DRAM), different DRAM cells, refresh circuits, timings.

**Unit IV: Floor Planning and Placement**

Clock skew, Clock distribution techniques, clock jitter. Supply and ground bounce, power distribution techniques. Power optimization. Interconnect routing techniques; wire parasitic, Signal integrity issues. I/O architecture, pad design.

**Unit V: Design and Verification with PLD’s**
Implementing Functions in FPGAs, Implementing Functions Using Shannon’s Decomposition, Carry Chains in FPGAs, Cascade Chains in FPGAs, Examples of Logic Blocks in Commercial FPGAs, Dedicated Memory in FPGAs, Dedicated Multipliers in FPGAs, JTAG, Boundary scan, TAP Controller.

**Unit VI: CAD Tools**


**Text Book:**


**Reference Book:**

4. Samir Palnitkar, Verilog HDL 2/e, Pearson Education.

**List of Experiments:**

**PART-A (Perform any four)**

Modelling and Functional Simulation, synthesis and implementation on PLDs of the following digital circuits (with Xilinx/ ModelSim tools/Pyxis) using VHDL/Verilog Hardware Description Languages. (Two experiments are to be performed using VHDL and two using Verilog.)

1. Parity generator
2. Cyclic Encoder / Decoder
3. Read Only Memory (ROM)/ Random Access Memory (RAM) implementation
4. Mealy State Machine/Moore State Machine-examples
5. Arithmetic Multipliers using FSMs
6. Digital calculator
PART-B (Perform any four) Experiments shall be carried out using Mentor Graphics/Cadence Tools/Microwind

Schematic Entry/ Simulation / Layout/ DRC/PEX/Post Layout Simulation of:

1. CMOS Inverter
2. NAND Gate/ OR Gate
3. Flip Flops (T & D)
4. Register Cell
5. Adder Circuits

PART- C (Optional)

VLSI system design using IP generator-Vivado software

Course Objectives:

- To offer an understanding of principle concepts, central topics and basic approaches in information and cyber security.
- To know the basics of cryptography.
- To acquire knowledge of standard algorithms and protocols employed to provide confidentiality, integrity and authenticity.
- To enhance awareness about Personally Identifiable Information (PII), Information Management, cyber forensics.

Course Outcomes:

1. Gauge the security protections and limitations provided by today's technology.
2. Identify information security and cyber security threats.
3. Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
4. Build appropriate security solutions against cyber-attacks.

Course Contents:

Unit I: Security Basics


Unit II: Data Encryption Techniques And Standards

Unit III: Public Key And Management


Unit IV: Security Requirements


Unit V: Firewall And Intrusion


Unit V: Confidentiality And Cyber Forensic

Introduction to Personally Identifiable Information (PII), Cyber Stalking, PII impact levels with examples Cyber Stalking, Cybercrime, PII Confidentiality Safeguards, Information Protection Law: Indian Perspective.

Text Books:


Reference Books:


List of Experiments:

1. Implementation of S-DES
2. Implementation of S-AES
3. Implementation of Diffie-Hellman key exchange
4. Implementation of RSA.
5. Implementation of ECC algorithm.
6. **Mini Project 1:** SQL Injection attacks and Cross-Site Scripting attacks are the two most common attacks on web application. Develop a new policy based Proxy Agent, which classifies the request as a scripted request or query based request, and then, detects the respective type of attack, if any in the request. It should detect both SQL injection attack as well as the Cross-Site Scripting attacks.
7. **Mini Project 2:** This task is to demonstrate insecure and secured website. Develop a web site and demonstrate how the contents of the site can be changed by the attackers if it is http based and not secured. You can also add payment gateway and demonstrate how money transactions can be hacked by the hackers. Then support your website having https with SSL and demonstrate how secured website is.

**Digital Image Processing**

**Course Objectives:**
- To learn the fundamental concepts of Digital Image and video Processing.
- To study basic image and video processing operations.
- To understand image and video analysis algorithms.
- To expose students to current applications in the field of digital image and video processing.

**Course Outcomes:**

On completion of the course, student will be able to–
1. Develop and implement various mathematical operations on image.
2. Develop and implement algorithms for image enhancement and restoration.
3. Apply compression techniques for image and video processing.
4. Use segmentation and morphological operations for image processing applications.
5. Apply video processing algorithms for motion detection applications.

**Course Contents:**

**Unit I: Digital Image Fundamentals**
Steps in image processing, Human visual system, Sampling & quantization, Representing digital images, Spatial & gray-level resolution, Image file formats, Basic relationships between pixels, Distance Measures. Basic operations on images-image addition, subtraction, logical operations, scaling, translation, rotation. Image Histogram. Color fundamentals & models – RGB, HSI YIQ.

**Unit II: Image Enhancement and Restoration**
Spatial domain enhancement: Point operations-Log transformation, Power-law transformation, Piecewise linear transformations, Histogram equalization. Filtering operations- Image smoothing, Image sharpening. Frequency domain enhancement: 2D DFT, Smoothing and Sharpening in frequency

Unit III: Image Compression


Unit IV: Image Segmentation and Morphological Operations


Unit V: Basics of Video Processing

Video formation, perception and representation: Principle of color video, video cameras, video display, pinhole model, CAHV model, Camera motion, Shape model, motion model, Scene model, two dimensional motion models. Three Dimensional Rigid Motion, Approximation of projective mapping.

Unit VI: Motion estimation Techniques

Optical flow, motion representation, motion estimation criteria, optimization methods, pixel based motion estimation, Block matching algorithm, gradient based, Intensity matching, feature matching, frequency domain motion estimation, Depth from motion. Motion analysis applications: Video Summarization, video surveillance.

Text Book:
2. Digital Video processing, A Murat Tekalp, Prentice Hall.

References:
2. Video Processing and Communications, Yao Wang, J. Ostermann and Qin Zhang, Pearson Education.

List of Experiments:
1. Conversion of 24 bit color image to 8 bit, 4 bit, 1 bit image.
2. Apply image negation and power-law correction operations on image.
3. Enhance image using histogram equalization and stretching.
4. Perform image smoothing and sharpening operations.
5. Detect image edges using Sobel, Prewitt and Roberts’s operator.
6. Perform Morphological operations on binary images.
7. Compress image using DCT / Wavelet transform.
8. Apply Global and adaptive thresholding to an image.
9. Using frequency domain technique estimates the motion in video.
10. Implement algorithm for video boundary detection.
   
   Note: Experiments are to be performed preferably using open source software.

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**ELECTIVE-II**

**Teaching Scheme:**
Lectures: 3 Hrs/ Week

**Examination Scheme:**
In Semester Examination: Phase I: 30
End Semester Examination: Phase II: 70

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**Mobile Communication**

**Course Objectives:**
- To understand switching techniques for voice and data traffic.
- To nurture students with knowledge of traffic engineering to design networks.
- To realize importance of cellular concepts and its propagation mechanism.
- To understand architecture of GSM system.
- To overview 4G LTE and 5G technologies.

**Course Outcomes:**
On completion of the course, students will be able to
1. Apply the concepts of switching technique and traffic engineering to design multistage networks.
2. Explore the architecture of GSM.
3. Differentiate thoroughly the generations of mobile technologies.

**Course Contents:**

**Unit I - Switching techniques for Voice and Data**

**Unit II - Traffic Engineering and Signaling**

Unit III: Cellular Concept

Unit IV: GSM Fundamentals

Unit V: GSM Channels and Services
Traffic and Logical Channels in GSM, GSM time hierarchy, GSM burst structure, Description of call setup procedure, Handover mechanism in GSM, Security in GSM. Data transmission in GSM: Data Services, SMS, HSCSD, GPRS, EDGE. Multiple Access Techniques-TDMA, CDMA and OFDMA.

Unit VI: Evolution of Mobile Technologies
Evolution of Mobile Generation and its comparison (GSM & CDMA), Overview of LTE: LTE basics, LTE frame structure, LTE Design parameters with Standardization and Architecture of LTE. Overview of 5G Networks: Comparison of 4G and 5G technology, Opportunities and requirements in 5G network, Open Wireless Architecture of 5G network and Disruptive technologies for 5G.

Text Books
1. Thiagarajan Vishwanathan, —Telecommunication Switching Systems and Networks‖; PHI Publications

Reference Books
1. Fei Hu, —Opportunities in 5G Networks : A research& development perspective‖, CRC Press
2. J. E. Flood, —Telecommunications Switching, Traffic and Networks‖, Pearson Education
5. Mischa Schwartz, Mobile Wireless Communications‖, Cambridge University Press

Robotics and Automation
Course Objectives:
The objective of this course is to impart knowledge about basic mathematics related to industrial robots for their control, design and application in robotics & automation Industries.

Course Outcomes:
Upon successful completion of this course, the student will be able to:
1. Perform kinematic and dynamic analyses with simulation.
2. Design control laws for a simple robot.
3. Integrate mechanical and electrical hardware for a real prototype of robotic device.
4. Select a robotic system for given industrial application.

Course Contents:

Unit 1: Introduction to Robotics:
Types and components of a robot, Classification of robots, Kinematics systems; Definition of mechanisms and manipulators, Degrees of Freedom

Unit 2: Robot Kinematics and Dynamics:
Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Forward and inverse kinematics, Jacobian, Singularity, and Statics.
Dynamic Modelling: Forward and inverse dynamics, Equations of motion using Euler-Lagrange formulation, Newton Euler formulation

Unit 3: Sensors
Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc., Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity/Affine/Projective transformations, Vision applications in robotics.

Unit 4: Robot Actuation Systems:

Unit 5: Robot Control:
Basics of control: open loop- closed loop, Transfer functions, Control laws: P, PD, PID Linear and Non-linear controls

Unit 6: Control Hardware and Interfacing:
1) Embedded systems: Microcontroller Architecture and integration with sensors, actuators, components, Programming, Applications for Industrial robot - programming in – VAL II
2) AI in Robotics: Applications in unmanned systems, defense, medical, industries, etc.
3) Robotics and Automation for Industry 4.0
4) Robot safety and social robotics.
Text Books
1) Introduction to Robotics : J. Craig , Pearson  
2) Robot Dynamics and Control, Spong & Vidyasagar, Mc Graw Hill  
3) Robotics Engineering : R. Klafter, PHI  

Software Testing and Quality Assurance

Course Objectives:
- Introduce basic concepts of software testing
- Understand white box, block box, object oriented, web based and cloud testing
- Know in details automation testing and tools used for automation testing
- Understand the importance of software quality and assurance software systems development.

Course Outcomes:
On completion of the course, student will be able to–
1. Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
2. Design and develop project test plan, design test cases, test data, and conduct test operations
3. Apply recent automation tool for various software testing for testing software
4. Apply different approaches of quality management, assurance, and quality standard to software system
5. Apply and analyze effectiveness Software Quality Tools

Course contents:

Unit I: Introduction

Unit II: Test Planning and Management
Review of Fundamentals of Software Testing, Testing during development life cycle, Requirement Traceability matrix, essentials, Work bench, Important Features of Testing Process, Misconceptions, Principles, salient and policy of Software testing, Test Strategy, Test Planning, Testing Process and number of defects found, Test team efficiency, Mutation testing, challenges, test team approach,
Process problem faced, Cost aspect, establishing testing policy, methods, structured approach, categories of defect, Defect/ error/ mistake in software, Developing Test Strategy and Plan, Testing process, Attitude towards testing, approaches, challenges, Raising management awareness for testing, skills required by tester.

**Unit III: Software Test Automation** 6L

**Unit IV: Selenium Tool** 6L
Introducing Selenium, Brief History of The Selenium Project, Selenium’s Tool Suite, Selenium- IDE, Selenium RC, Selenium Webdriver, Selenium Grid, Test Design Considerations

**Unit V: Quality Management** 6L

**Unit VI: Software Quality Tools** 6L

**Text Books:**

**Reference Books:**

**Artificial Intelligence and Machine Learning**

**Course Objectives:**
- To understand human learning aspects and relate it with machine learning concepts.
- To understand nature of the problem and apply machine learning algorithm.
- To find optimized solution for given problem.

**Course Outcomes:**
On completion of the course, student will be able to,

1. Distinguish different learning based applications
2. Apply different preprocessing methods to prepare training data set for machine learning.
3. Design and implement supervised and unsupervised machine learning algorithm.
4. Implement different learning models
5. Learn Meta classifiers and deep learning concepts

Course contents:

Unit I Introduction to Machine learning


Unit II Feature Selection

Scikit-learn Dataset, Creating training and test sets, managing categorical data, Managing missing features, Data scaling and normalization, Feature selection and Filtering, Principle Component Analysis(PCA)-non negative matrix factorization, Sparse PCA, Kernel PCA. Atom Extraction and Dictionary Learning.

Unit III Regression

Linear regression- Linear models, A bi-dimensional example, Linear Regression and higher dimensionality, Ridge, Lasso and ElasticNet, Robust regression with random sample consensus, Polynomial regression, Isotonic regression, Logistic regression-Linear classification, Logistic regression-Implementation and Optimizations, Stochastic gradient descent algorithms, Finding the optimal hyper-parameters through grid search, Classification metric, ROC Curve.

Unit IV Naïve Bayes and Support Vector Machine


Unit V Decision Trees and Ensemble Learning


Unit VI Clustering Techniques

Hierarchical Clustering, Expectation maximization clustering, Agglomerative Clustering-Dendrograms, Agglomerative clustering in Scikit-learn, Connectivity Constraints. Introduction to Recommendation Systems- Naïve User based systems, Content based Systems, Model free

**Text Books**


**Reference Books**


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**LAB PRACTICE –I**

**Teaching Scheme:**
Practical: 4 Hrs./ Week

**Examination Scheme:**
Termwork (TW): 25
Practical (PR): 50

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**Advanced Techniques for Electrical Vehicle**

**List of Experiments:**
1. Study of major components of Electric vehicles.
2. Study and test function of Mechatronics component of Electric vehicle.
4. Study the function of accelerator and impact on motor speed and torque.
5. Study of load variations on various motors of Electrical Vehicles on different gradient/load.
6. Study of battery and its parameter at loading and unloading of motor.
7. Study of chargers and effect on charging time by change in voltage, current and battery type.
8. Study the trouble shooting and testing waveforms of different drive trains of Electrical Vehicles and Battery parameter.

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**Internet of Things**

**List of Experiments:**
Perform any 4 experiments from group A and Any 4 from Group B, Any 1 from Group C

**Group A**

1. Study of Connectivity and configuration of Arduino board circuit with basic peripherals, LEDs. Understanding GPIO and its use in program.
2. Interfacing touch sensor, LDR, with Arduino board.
3. Interfacing of DC motor and servo motor with Arduino Board.
4. Interfacing temperature and humidity sensor using I2C protocol with Arduino board.
5. Interfacing of ultrasonic sensor with Arduino
7. Interfacing Wifi module with Arduino.
8. Interfacing Xbee module with Arduino.

**Group B**

9. Study of different operating systems for Raspberry-Pi /Beagle board. Understanding the process of OS installation on Raspberry-Pi /Beagle board.
10. Study of Connectivity and configuration of Raspberry-Pi /Beagle board circuit with basic peripherals, LEDS. Understanding GPIO and its use in program.
11. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with temperature sensor. Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDs.
12. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor. Write an application to detect obstacle and notify user using LEDS.
13. Understanding and connectivity of Raspberry-Pi /Beagle board with IR sensor. Write an application to for obstacle detection.
14. Understanding and connectivity of Raspberry-Pi /Beagle board with a Zigbee module. Write a network application for communication between two devices using Zigbee.
15. Write a server application to be deployed on Raspberry-Pi /Beagle board. Write client applications to get services from the server application.
16. Create a simple web interface for Raspberry-pi/Beagle board to control the connected LEDs remotely through the interface.

**Group C**

17. Develop a Real time application like smart home with following requirements: When user enters into house the required appliances like fan, light should be switched ON. Appliances should also get controlled remotely by a suitable web interface. The objective of this application is student should construct complete Smart application in group.
18. Develop a Real time application like a smart home with following requirements: If anyone comes at door the camera module automatically captures his image send it to the email account of user or send notification to the user. Door will open only after user’s approval.
Experiments to be chosen based on Elective I

MOOC

Teaching Scheme:  
Practical: 4 Hrs./ Week

Examination Scheme:  
Termwork (TW): 25
Practical (PR): 50

Course Objectives:

- To promote interactive user forums to support community interactions among students, professors, and experts
- To promote learn additional skills anytime and anywhere
- To enhance teaching and learning on campus and online

Course Outcomes:

On completion of the course, learner will acquire additional knowledge and skill.

MOOCs (Massive Open Online Courses) provide affordable and flexible way to learn new skills, pursue lifelong interests and deliver quality educational experiences at scale. Whether you're interested in learning for yourself, advancing your career or leveraging online courses to educate your workforce, SWYAM, NPTEL, edx or similar ones can help.

World’s largest SWAYAM MOOCs, a new paradigm of education for anyone, anywhere, anytime, as per your convenience, aimed to provide digital education free of cost and to facilitate hosting of all the interactive courses prepared by the best more than 1000 specially chosen faculty and teachers in the country. SWAYAM MOOCs enhances active learning for improving lifelong learning skills by providing easy access to global resources.

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

This is done through an indigenous developed IT platform that facilitates hosting of all the courses, taught in classrooms from 9th class till post-graduation to be accessed by anyone, anywhere at any time. All the courses are interactive, prepared by the best teachers in the country and are available, free of cost to the residents in India. More than 1,000 specially chosen faculty and teachers from across the Country have participated in preparing these courses.
The courses hosted on SWAYAM is generally in 4 quadrants – (1) video lecture, (2) specially prepared reading material that can be downloaded/printed (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing the doubts. Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology. In order to ensure best quality content are produced and delivered, seven National Coordinators have been appointed: They are NPTEL for engineering and UGC for post-graduation education.

Guidelines:
Instructors are requested to promote students to opt for courses (not opted earlier) with proper mentoring. The departments will take care of providing necessary infrastructural and facilities for the learners.

References:
1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/
3. https://www.edx.org

Project Stage I

Teaching Scheme:  Examination Scheme:
Practical: 4 Hrs./ Week     Termwork (TW): 50
                        ORAL (OR): 50

Course Objectives:
• To Apply the knowledge for solving realistic problem
• To develop problem solving ability
• To Organize, sustain and report on a substantial piece of team work over a period of several months
• To Evaluate alternative approaches, and justify the use of selected tools and methods
• To Reflect upon the experience gained and lessons learned,
• To Consider relevant social, ethical and legal issues,
• To find information for yourself from appropriate sources such as manuals, books, research journals and from other sources, and in turn increase analytical skills.
• To Work in TEAM and learn professionalism.

Course Outcomes:
On completion of the course, student will be able to–
1. Solve real life problems by applying knowledge.
2. Analyze alternative approaches, apply and use most appropriate one for feasible solution.
3. Write precise reports and technical documents in a nutshell.
4. Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work, interpersonal relationships, conflict management and leadership quality.

**Guidelines**

Project work Stage – I is an integral part of the Project work. In this, the student shall complete the partial work of the Project which will consist of problem statement, literature review, SRS, Model and Design. The student is expected to complete the project at least up to the design phase. As a part of the progress report of project work Stage-I, the candidate shall deliver a presentation on the advancement in Technology pertaining to the selected project topic. The student shall submit the duly certified progress report of Project work Stage-I in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

The examinee will be assessed by a panel of examiners of which one is necessarily an external examiner. The assessment will be broadly based on work undergone, content delivery, presentation skills, documentation, question-answers and report.
SEMESTER –II

Computer Network

Teaching Scheme:
Lectures: 3 Hrs/ Week

Examination Scheme:
In Semester Examination: Phase I: 30
End Semester Examination: Phase II: 70

Course Objectives:
- To understand the fundamental concepts of networking standards, protocols and technologies.
- To learn different techniques for framing, error control, flow control and routing.
- To learn role of protocols at various layers in the protocol stacks.
- To learn network programming.
- To develop an understanding of modern network architectures from a design and performance perspective

Course Outcomes:
On completion of the course, student will be able to–
1. Analyze the requirements for a given organizational structure to select the most appropriate networking architecture and technologies
2. Demonstrate LAN and WAN protocol behavior using Modern Tools.
3. Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.
4. Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.
5. Develop Client-Server architectures and prototypes by the means of correct standards and technology.

Course Contents

Unit I: Physical Layer 7L
Introduction of LAN; MAN; WAN; PAN, Ad-hoc Network, Network Architectures: Client-Server; Peer To Peer; Distributed and SDN, OSI Model, TCP/IP Model, Topologies: Star and Hierarchical; Design issues for Layers, Transmission Mediums: CAT5, 5e, 6, OFC and Radio Spectrum, Network Devices: Bridge, Switch, Router, Brouter and Access Point, Manchester and Differential Manchester Encodings; IEEE802.11: Frequency Hopping (FHSS) and Direct Sequence (DSSS)

Unit II: Logical Link Control 7L
Design Issues: Services to Network Layer, Framing, Error Control and Flow Control. Error Control: Parity Bits, Hamming Codes (11/12-bits) and CRC. Flow Control Protocols: Unrestricted Simplex, Stop and Wait, Sliding Window Protocol, WAN Connectivity: PPP and HDLC

Unit III: Medium Access Control 6L
Cloud Computing

Unit IV: Network Layer
Switching techniques, IP Protocol, IPv4 and IPv6 addressing schemes, Subnetting, NAT, CIDR, ICMP, Routing Protocols: Distance Vector, Link State, Path Vector, Routing in Internet: RIP, OSPF, BGP, Congestion control and QoS, MPLS, Mobile IP, Routing in MANET: AODV, DSR

Unit V: Transport Layer
Services, Berkeley Sockets, Addressing, Connection establishment, Connection release, Flow control and buffering, Multiplexing, TCP, TCP Timer management, TCP Congestion Control, Real Time Transport protocol (RTP), Stream Control Transmission Protocol (SCTP), Quality of Service (QoS), Differentiated services, TCP and UDP for Wireless.

Unit VI: Application Layer
Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Email: SMTP, MIME, POP3, Webmail, FTP, TELNET, Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP).

Text Books:

References:

Teaching Scheme:
Lectures: 3 Hrs/ Week

Examination Scheme:
In Semester Examination: Phase I: 30
End Semester Examination: Phase II: 70

Course Objectives:
- To become familiar with Cloud Computing and its ecosystem.
- To learn basics of virtualization and its importance.
- To evaluate in-depth analysis of Cloud Computing capabilities.
• To give technical overview of Cloud Programming and Services.
• To understand security issues in cloud computing.
• To be exposed to Ubiquitous Cloud and Internet of Things.

**Course Outcomes:**

1. To understand the need of Cloud based solutions.
2. To understand Security Mechanisms and issues in various Cloud Applications
3. To explore effective techniques to program Cloud Systems.
5. To find challenges in cloud computing and delve into it to effective solutions.
6. To understand emerging trends in cloud computing.

**Course Contents**

**UNIT I: FUNDAMENTALS OF CLOUD COMPUTING**

6L


**UNIT II: Virtualization and Common Standards in Cloud Computing**

6L


**UNIT III: CLOUD PROGRAMMING, ENVIRONMENTS AND APPLICATIONS**

6L

Applications: Moving application to cloud, Microsoft Cloud Services, Google Cloud Applications, Amazon Cloud Services, Cloud Applications (Social Networking, E-mail, Office Services, Google Apps, and Customer Relationship Management).

**UNIT IV: CLOUD SECURITY AND ISSUES**

6L

UNIT V: UBIQUITOUS CLOUDS AND THE INTERNET OF THINGS 6L

UNIT VI: FUTURE OF CLOUD COMPUTING 6L


Text Books

Reference Books

ELECTIVE-III

Teaching Scheme: Lectures: 3 Hrs/ Week

Examination Scheme: In Semester Examination: Phase I: 30
End Semester Examination: Phase II: 70
Course Objectives:

- To understand the stages of system (hardware/software) design and development.
- To learn the different considerations of analog, digital and mixed circuit design.
- To be acquainted with methods of PCB design and different tools used for PCB Design.
- To understand the importance of testing in product design cycle.
- To understand the processes and importance of documentation.

Course Outcomes:

After successfully completing the course students will be able to
1. Understand various stages of hardware, software and PCB design.
2. Analyze reliability of product design.
3. Design and test various electronic products/modules.
4. Suggest special design considerations and understand need of documentation.

Course contents:

Unit I: Introduction 6L

Unit II: Hardware Design- Analog Circuits 6L
Analog signal conditioning: Factors affecting choice of Op-Amps in signal conditioning, applications, Need for Instrumentation Amplifiers- Case study of an Instrumentation amplifier circuit designed using discrete components and special purpose IC. Error budget analysis with case study. Interpretation of ADC and DAC specifications from design view point, considerations in selecting references (Vref for ADC).

Unit III: Hardware Design- Digital Circuits 6L
Interfacing of LED, HB LED, LCD, Keyboard, Relays (Electromagnetic and Solid State) with Microcontrollers. Comparative study of different Microcontroller architectures, Factors affecting choice of Microcontroller for particular application with case study of one application. Comparison of buses and protocols used in electronic products- I2C, SPI, CAN, LIN, Flexray.

Unit IV: Software Design and Testing for Electronic Product 6L
Different approaches for development of application software for Electronic Product. Assemblers, Factors affecting choice between Assembly language and High level languages like C and C++. Documentation
practices and templates for above software. Debugging tools and techniques for software- Features of Simulators, ICE, IDE.

Unit V: PCB Design and EMI/EMC

PCB Design practices for Analog and Mixed signal circuits: Ground Loops, Precision circuits, shielding and guarding. PCB Design Practices for High speed digital circuits, Signal integrity and EMC, EMI/EMC testing standards and compliance for PCB design.

Unit VI: Fault Finding and Testing


Text Books:

Reference Books:

List of Experiments:
1. Design and implement low dropout regulated power supply (Estimation of current requirement)
2. Design of SPAN ZERO circuit.
3. Design and implement Transducer interface using Wheatstone bridge.
4. Study of Error budget analysis of instrumentation amplifier or any other complicated circuit using ADC/ DAC.
5. Design Data Acquisition System (DAS) using appropriate Microcontroller.
6. PCB Design for Mixed Signal Circuit (Involving ADC and Signal Conditioning). Test the circuit using MSO.
7. DC and AC analysis of given circuit.
8. Sensitivity analysis for given circuit.
9. Reliability calculations from given data.
10. Visit to product based industry to study various processes.

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**Optical Fiber Communication**

**Course Objectives:**

- To understand the about the various optical fiber modes, configuration and transmission characteristics of optical fibers.
- To learn about the various optical sources, detectors and transmission techniques.
- To explore various idea about optical fiber measurements and various coupling techniques.
- To enrich the knowledge about optical communication systems and networks.

**Course Outcomes:**

After successfully completing the course, students will be able to
- Understand advantages and applications of optical communication.
- Identify different optical devices with their operating principle.
- Formulate optical communication problem for synthesis.

**Course Contents:**

**Unit I: Fundamentals of FOC**

Basic block diagram of Optical Fiber Communication system, Principles of light propagation through a fiber, Different types of fibers and their characteristics, Attenuation, Distortion, Pulse broadening in GI fibers, Mode coupling, Coupling losses, Material dispersion, Dispersion in single-mode and multimode fibers, Connectors & splicers.

**Unit II: Optical Sources**

Working principle and characteristics of sources (LED, LASER), Tunable lasers, Quantum well lasers, Charge capture in Quantum well lasers, Multi Quantum well Laser diodes, Surface Emitting Lasers: Vertical cavity Surface Emitting Lasers

**Unit III: Optical Detectors**

Working principle and characteristics of detectors (PIN, APD), Material requirement for RCEPD, Resonant cavity enhancement (RCE) Photo Detector, Noise analysis in detectors, coherent and noncoherent detection, receiver structure, bit error rate of optical receivers, and receiver performance

**Unit IV: Fiber Optic Components**

Fiber fabrication (VAD, MCVD), fiber joints, fiber connectors, splices Couplers, multiplexers, filters, fiber gratings, Fabry Perot filters, switches and wavelength converters, Optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA.

**Unit V: Optical Link**

Introduction, Point to point links, system considerations, link power budget, and rise time budget. RF over fiber, key link parameters, Radio over fiber links, microwave photonics.
System design consideration: Point to Point link design, Link power budget, rise time budget, WDM, Passive DWDM Components, Elements of optical networks, SONET/SDH, Optical Interfaces-SONET/SDH Rings and Networks-High speed light wave Links, OADM configuration, Optical ETHERNET Soliton

**Text Books:**


**Reference Books:**

1. Fiber optics communications-Harold Kolimbiris
2. Introduction to optical fibers, Cheri, McGraw Hill.
3. An introduction to fiber optics, A. Ghatak and K.Thyagrajan, Cambridge Univ, press 10
4. Optical fiber communication and sensors-M. Arumugam Agencies, 20002 optic sensors.

**List of Experiments:**

1. DC Characteristics of LED and PIN Photo diode
7. Study of any two optical instruments: Optical Power Meter, OTDR, OSA etc.
8. Fiber optic Analog and Digital Link- frequency response(analog) and eye diagram (digital).

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**Data Mining and Ware Housing**

**Course Objectives:**

- To understand the fundamentals of Data Mining
- To identify the appropriateness and need of mining the data
- To learn the preprocessing, mining and post processing of the data
- To understand various methods, techniques and algorithms in data mining

**Course Outcomes:**

On completion of the course the student should be able to-

1. Apply basic, intermediate and advanced techniques to mine the data
2. Analyze the output generated by the process of data mining
3. Explore the hidden patterns in the data
4. Optimize the mining process by choosing best data mining technique

**Course Contents**

**Unit I: Introduction**  
Data Mining, Data Mining Task Primitives, Data: Data, Information and Knowledge; Attribute Types: Nominal, Binary, Ordinal and Numeric attributes, Discrete versus Continuous Attributes; Introduction to Data Preprocessing, Data Cleaning: Missing values, Noisy data; Data integration: Correlation analysis; transformation: Min-max normalization, z-score normalization and decimal scaling; data reduction: Data Cube Aggregation, Attribute Subset Selection, sampling; and Data Discretization: Binning, Histogram Analysis

**Unit II: Data Warehouse**  

**Unit III: Measuring Data Similarity and Dissimilarity**  
Measuring Data Similarity and Dissimilarity, Proximity Measures for Nominal Attributes and Binary Attributes, interval scaled; Dissimilarity of Numeric Data: Minkowski Distance, Euclidean distance and Manhattan distance; Proximity Measures for Categorical, Ordinal Attributes, Ratio scaled variables; Dissimilarity for Attributes of Mixed Types, Cosine Similarity.

**Unit IV: Association Rules Mining**  
Market basket Analysis, Frequent item set, Closed item set, Association Rules, a-priori Algorithm, Generating Association Rules from Frequent Item sets, Improving the Efficiency of a-priori, Mining Frequent Item sets without Candidate Generation: FP Growth Algorithm; Mining Various Kinds of Association Rules: Mining multilevel association rules, constraint based association rule mining, Meta rule-Guided Mining of Association Rules.

**Unit V: Classification**  
Introduction to: Classification and Regression for Predictive Analysis, Decision Tree Induction, Rule-Based Classification: using IF-THEN Rules for Classification, Rule Induction Using a Sequential Covering Algorithm, Bayesian Belief Networks, Training Bayesian Belief Networks, Classification Using Frequent Patterns, Associative Classification, Lazy Learners-k-Nearest-Neighbor Classifiers, Case-Based Reasoning.

**Unit VI: Multiclass Classification**  
Multiclass Classification, Semi-Supervised Classification, Reinforcement learning, Systematic Learning, Wholistic learning and multi-perspective learning. Metrics for Evaluating Classifier Performance: Accuracy, Error Rate, precision, Recall, Sensitivity, Specificity; Evaluating the Accuracy of a Classifier: Holdout Method, Random Sub sampling and Cross-Validation
Text Books:

References Books:

Course Objectives:
- To design, implement and evaluate effective and usable Human Computer Interfaces.
- To describe and apply core theories, models and methodologies from the field of HCI.
- Learn a variety of methods for evaluating the quality of a user interface
- To implement simple graphical user interfaces based on principles of HCI.

Course Outcomes:
On completion of the course, student will be able to–
1. Evaluate the basics of human and computational abilities and limitations.
2. Inculcate basic theory, tools and techniques in HCI.
3. Apply the fundamental aspects of designing and evaluating interfaces.
4. Apply appropriate HCI techniques to design systems that are usable by people

Course Contents

Unit I Foundations of Human–Computer Interaction
What is HCI – design, models, evaluation, Need to understand people, computers and methods. Basic human abilities - vision, hearing, touch, memory.


Methods for evaluation of interfaces with users: goals of evaluation, approaches, ethics, introspection, extracting the conceptual model, direct observation, constructive interaction, interviews and questionnaires, continuous evaluation via user feedback and field studies, choosing an evaluation method.

Unit II: The Design Process
Interaction Design Basics, Interaction Styles. HCI in the Software Process. HCI design principles and rules: design principles, principles to support usability, golden rules and heuristics, HCI patterns,
design rules, HCI design standards. Direct Manipulation - Overview, Scope, Applications. Universal Design, User-centered design, task analysis/GOMS, Graphic Design

Unit III: Implementation


Unit IV: Evaluation and User Support


Unit V: Users Models


Unit VI: Task Models and Dialogs


Text Books:

Reference Books:

Teaching Scheme:
Lectures: 3 Hrs/ Week

Examination Scheme:
In Semester Examination: Phase I: 30
End Semester Examination: Phase II: 70

ELECTIVE-IV

Software Defined Radio

Course Objectives:
- To understand —Modern Radio Communication System — that can be reconfigured To understand GNU Radio
- To understand how SDR platform provides easy access to wireless network system
To understand how unlike simulation in Communication Projects, SDR allows easy access to both PHY and MAC layer.

To understand the concept of Cognitive Radio and Spectrum sharing

**Course Outcomes:**

On completion of the course, student will be able to

1. Compare SDR with traditional Hardware Radio HDR.
2. Implement modern wireless system based on OFDM, MIMO & Smart Antenna.
3. Build experiment with real wireless waveform and applications, accessing both PHY and MAC. Compare SDR versus MATLAB and Hardware Radio Work on open projects and explore their capability to build their own communication System.

**Course Contents:**

**Unit I: Introduction to SDR and RF Implementation**

Introduction to SDR, Need of SDR, Principles of SDR, Basic Principle and difference in Analog radio and SDR, SDR characteristics, required hardware specifications, Software/Hardware platform, GNU radio - What is GNU radio, GNU Radio Architecture, Hardware Block of GNU, GNU software, MATLAB in SDR, Radio Frequency Implementation issues, Purpose of RF front End, Dynamic Range, RF receiver Front End topologies, Flexibility of RF chain with software radio, Duplexer , Diplexer , RF filter , LNA , Image reject filters , IF filters , RF Mixers, Local Oscillator , AGC, Transmitter Architecture and their issues, Sampling theorem in ADC, Noise and distortion in RF chain, Pre-distortion

**Unit II: SDR Architecture**


**Unit III: Multi Rate Signal Processing**

Sample timing algorithms, Frequency offset estimation and correction, Channel Estimation, Basics of Multi Rate, Multi Rate DSP, Multi Rate Algorithm, DSP techniques in SDR, OFDM in SDR

**Unit IV: Smart/MIMO Antennas using Software Radio**


**Case Study:** Principles of MIMO-OFDM

**Unit V: Cognitive Radio**

Wireless Sensor Network

Course Objectives:

- To learn basic concepts of wireless sensor networks.
- To be familiar with architecture and protocols used in wireless sensor networks.
- To provide knowledge of deployment and security issues of wireless sensor networks.

Course Outcomes:

On completion of the course, students will be able to

- Explain various concepts and terminologies used in WSN.
- Describe importance and use of radio communication and link management in WSN.
- Explain various wireless standards and protocols associated with WSN.
- Recognize importance of localization and routing techniques used in WSN.
- Understand techniques of data aggregation and importance of security in WSN.
- Examine the issues involved in design and deployment of WSN.

Course Contents:

Unit I: Introduction

Unit II: Radio Communication & Link Management


Unit III: Wireless Standards & Protocol Stack

WSN Standards- IEEE802.15.4 low rate WPAN, Zigbee, Wireless HART, ISA 100.11a, 6LoWPAN, IEEE802.15.3, Wibree, BLE, Zwave, ANT, Insteon, Wavenis, Protocol stack of WSNs, Cross Layer Protocol Stack.

Unit IV: Localization & Routing


Unit V: Data Aggregation & Security


Unit VI: Designing & Deploying WSN Applications


Text Books:

Reference Books:
Course Objectives:
- To develop problem solving abilities using mathematical theories
- To analyze the performance of algorithms
- To study algorithmic design strategies

Course Outcomes:
On completion of the course, student will be able to–
1. Formulate the problem
2. Analyze the asymptotic performance of algorithms
3. Decide and apply algorithmic strategies to solve given problem
4. Find optimal solution by applying various methods

Course Contents

Unit I: Fundamentals 7L
The Role of Algorithms in Computing - What are algorithms, Algorithms as technology, Evolution of Algorithms, Design of Algorithm, Need of Correctness of Algorithm, Confirming correctness of Algorithm – sample examples, Iterative algorithm design issues

Unit II: Models and Design 7L

Unit III: Abstract Algorithms 7L

Unit IV: Complexity Theory 7L
Complexity theory – Counting Dominant operators, Growth rate, upper bounds, asymptotic growth, O, Ω, Θ, o and ω notations, polynomial and non-polynomial problems, deterministic and non-deterministic algorithms, P-class problems, NP-class of problems, Polynomial problem reduction NP complete problems- vertex cover and 3-SAT and NP hard problem - Hamiltonian cycle

Unit V: Amortized Analysis 7L
Amortized Analysis – Binary, binomial and Fibonacci heaps, Dijkstra’s Shortest path algorithm, Splay Trees, Time-Space tradeoff, Introduction to Tractable and Non-tractable Problems, Introduction to Randomized and Approximate algorithms, Embedded Algorithms: Embedded system scheduling (power optimized scheduling algorithm), sorting algorithm for embedded systems.
Unit VI: Multithreaded and Distributed Algorithms


Books:

Reference Books:

Software Engineering

Course Objectives:
- To learn and understand the principles of Software Engineering
- To be acquainted with methods of capturing, specifying, visualizing and analyzing software requirements.
- To apply Design and Testing principles to S/W project development.
- To understand project management through life cycle of the project.
- To understand software quality attributes.

Course Outcomes:
On completion of the course, student will be able to–
- Decide on a process model for a developing a software project
- Classify software applications and Identify unique features of various domains
- Design test cases of a software system.
- Understand basics of IT Project management.
- Plan, schedule and execute a project considering the risk management.
- Apply quality attributes in software development life cycle. Course Contents
Course Contents:

Unit I Introduction to Software Engineering, Software Process Models  7L

Unit II Software Requirements Engineering & Analysis  7L

Case study - Mental health care patient management system (MHC-PMS).

Unit III: Design Engineering  6L

Unit IV Project Management: Process, Metrics, Estimations & Risks  7L

Unit V: Project management: risk management, configuration management, maintenance & reengineering  6L
Reengineering: Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering

**Unit VI: Software Testing** 7L


**Text Books:**

**Reference Books:**

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**Open Elective**

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**Lab Practice III**

**Teaching Scheme:**
Practical: 2 Hrs./ Week

**Examination Scheme:**
Termwork (TW): 25
Practical (PR): 50

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**Computer Network**

**List of Experiments:**

(Perform any 8 experiments)

1. Study of network commands & IP address configurations.
2. Study of Cable tester for fault detection of UTP-CAT5 Cross / Straight LAN cable.
3. Implementation of LAN using star topology and connectivity between two computers using cross over UTP CAT5 cable. (Cisco Packet Tracer)
4. Installation and configuration of Web Server and hosting web page using HTML programming. (Cisco Packet Tracer)
5. Installation and configuration of Proxy Server.
6. Installation and configuration of FTP server for FTP communication.
7. Installation and configuration of Telnet server for Telnet Communication. (Teamviewer)
8. Write a program in „C” for Encryption and Decryption (RSA Algorithm).
9. Write a program in „C” for Shortest Path algorithm.
10. Connectivity of LAN computers to Internet using Dial-Up modem/leased line Modem /Mobile Handset. (Installation and configuration).
11. Installation of Suitable Protocol Analyzing software and Analysis of Intranet activities. (Wireshark)
13. Study of any network simulation tools-To create a network with three nodes & establish a TCP connection between node 0 & node 1 such that node 0 will send TCP packet to node 2 via node 1.

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**Lab Practice IV**

**Teaching Scheme:**
Practical: 2 Hrs./ Week

**Examination Scheme:**
Termwork (TW): 25
Practical (PR): 50

**Elective-III**

**Experiments to be chosen based on Elective III.**

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**Project Stage II**

**Teaching Scheme:**
Practical: 12 Hrs./ Week

**Examination Scheme:**
Termwork (TW): 100
ORAL (OR): 50

**Course Objectives:**
- To follow SDLC meticulously and meet the objectives of proposed work
- To test rigorously before deployment of system
- To validate the work undertaken
- To consolidate the work as furnished report.
Course Outcomes:

On completion of the course, student will be able to—
1. Show evidence of independent investigation
2. Critically analyze the results and their interpretation.
3. Report and present the original results in an orderly way and placing the open questions in the right perspective.
4. Link techniques and results from literature as well as actual research and future research lines with the research.
5. Appreciate practical implications and constraints of the specialist subject

Guidelines

In Project Work Stage–II, the student shall complete the remaining project work which consists of Selection of Technology and Tools, Installations, UML implementations, testing, Results, performance discussions using data tables per parameter considered for the improvement with existing/known algorithms/systems and comparative analysis and validation of results and conclusions. The student shall prepare and submit the report of Project work in standard format for satisfactory completion of the work that is the duly certified by the concerned guide and head of the Department/Institute.