



Shri Shamrao Patil(Yadavkar)Educational&CharitableTrust's
Sharad Institute of Technology College of Engineering
 Yadav (Ichalkaranji) -416121, Dist. – Kolhapur

Department: Electronics and Computer Engineering **Rev:** Course Structure/01/NEP/2023-24

Class: T.Y.B. Tech

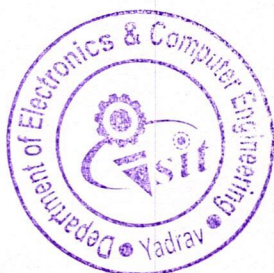
Semester: V

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
23EC3501	PCC	Digital Signal Processing	3	-	-	3	10	10	30	50	100	3
23EC3502	PCC	Embedded System	3	-	-	3	10	10	30	50	100	3
23EC3503	PCC	Object Oriented Programming	3	-	-	3	10	10	30	50	100	3
23EC3504	PEC	Program Elective Course-I	3	-	-	3	10	10	30	50	100	3
23EC3505	PCC	Digital Signal Processing Laboratory	-	-	2	2	15	15	-	20	50	1
23EC3506	PCC	Embedded System Laboratory	-	-	2	2	15	15	-	20	50	1
23EC3507	PCC	Object Oriented Programming Laboratory	-	-	2	2	15	15	-	20	50	1
23EC3508	CEP	Mini Project-III	-	-	2	2	25	25	-	-	50	1
23EC3509	INT/FT	Industrial Training/Field Training – I	-	-	-	-	-	-	-	-	50	Audit
23ECMDXX	MDM	Multidisciplinary Minor-III	3	-	-	3	10	10	30	50	100	3
23OEEC33	OE*	Open Elective-III	3	-	-	3	10	10	30	50	100	3
23HSSM05	VEC	Aptitude Skills-III	1	-	-	1	25	25	-	-	50	Audit
23HSSM06	VEC	Language Skills-III	-	-	2	2	25	25	-	-	50	Audit
		Total	19	-	10	29	180	180	180	360	950	22

Biomedical Engineering (Basket A)	Data Science (Basket B)	Industrial Automation (Basket C)
Control System(23ECMDA3)	Data Science and Its Application(23ECMDB3)	Control System(23ECMDC3)

Program Elective Course-I	A. Fuzzy Logic and Neural Network
	B. Network Theory
	C. Object Oriented Analysis and Modelling

Note- (OE*) Open Elective-III Course will be offered to students of other programs and will not be offered to the students of the same program.



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Digital Signal Processing

23EC3501	PCC	Digital Signal Processing	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

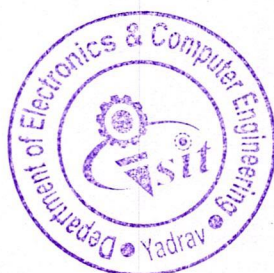
Pre-Requisites: Basics of mathematics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Interpret various signals and systems.
CO2	Apply Fourier Transform and Z transform techniques for arbitrary and periodic signals.
CO3	Analyze concept of DFT and apply to discrete-time signals.
CO4	Design and realize IIR and FIR filter using several techniques.

Course Contents:

Unit 1: Fundamentals of Signal and System Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids, Classification of signals- Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals Classification of systems- CT systems and DT systems- — Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.	[6]
Unit 2: Fourier Series and Fourier Transform Fourier series: Representation of Fourier series, Continuous-time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum. Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform.	[6]
Unit 3: Z transform Z-transform and its properties, Inverse z-transforms; Solution of difference equation using Z transform, relation between FT and ZT, relation between S plane and Z plane, Stability criteria.	[6]
Unit 4: Discrete Fourier Transform Introduction, Discrete Fourier transform (DFT), properties of DFT, Circular and linear convolution, method of circular convolution of two sequences, Filtering long duration sequences – overlap save and overlap-add method.	[6]



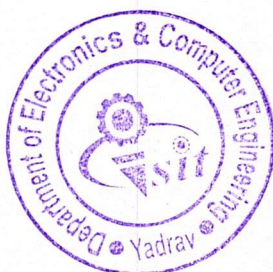
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Unit 5: Infinite Impulse Response Digital filters Introduction, Design of analog Butterworth and Chebyshev Filters, Frequency transformation in analog domain, Design of IIR digital filters from Analog filters - Impulse invariance techniques, Bilinear transform, Realization of IIR filters - Direct, cascade, and parallel forms.	[6]
Unit 6: Finite Impulse Response Digital Filters Introduction, Linear phase FIR filters, Location zeros of linear phase FIR filters, Design FIR filters using Hamming Window, Hanning Window and Rectangular Windows, Frequency sampling method of designing FIR filters, Realization of FIR filters Linear phase structures, Transversal structures.	[6]
Text Books: 1. Signals and Systems;-P.Ramesh Babu et al, 5th Edition, Scitech publishers, 2017. 2. Digital Signal Processing - 4th Edition -2007 ,P Ramesh babu. 3. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis. Pearson Education ,PHI. 2007. 4. Discrete Time Signal Processing. V. Oppenheim and R.W. Schaffer. PHI. 5. Fundamentals of Digital Signal Processing - Loney Ludeman. John Wiley, 2009	
Reference Books: 1. Digital Signal Processing - Fundamentals and Applications - Li Tan, Elsevier. 2008 2. Fundamentals of Digital Signal Processing using Matlab - Robert J. Schilling. Sandra L, Harris, Thomson. 2007 3. Digital Signal Processing - S.Salivahanan. A.Vallavaraj and CGnanapriya.TMH.2009 4. Discrete Systems and Digital Signal Processing with MATLAB -Taan S.EIAlI.CRC press. 2009	



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Embedded System

23EC3502	PCC	Embedded System	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Digital Electronics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the architecture, features, and working of microcontrollers.
CO2	Make use of assembly language and embedded c for interfacing external peripherals.
CO3	Explain Fundamental concepts of Embedded System.
CO4	Apply embedded system concepts and communication protocols for real-world applications.
CO5	Develop real-time applications using RTOS-based task scheduling techniques.
CO6	Analyze power optimization, fault tolerance, and safety aspects in embedded systems.

Course Contents:

Unit 1: Introduction to Microcontrollers Evolution of Microcontrollers, Microprocessor vs. Microcontroller, RISC vs. CISC Architecture, Overview of 8051 Microcontroller, Pin Configuration, Memory Organization, and Special Function Registers (SFRs), Instruction Set, Addressing Modes, and Assembly Language Programming, Basics of Embedded C for 8051	[6]
Unit 2: Advanced Microcontrollers and Interfacing ARM Cortex-M Series: Features and Architecture, GPIO, Timers, Interrupts, PWM in ARM Cortex-M, Introduction to AVR and PIC Microcontrollers, Serial Communication Protocols: UART, SPI, I2C, Interfacing External Peripherals (LCD, Keypad, Sensors, Motors) Case Study: Industrial Process Control Using ARM Cortex	[6]
Unit 3: Embedded System Fundamentals Definition and Classification of Embedded Systems, Components of Embedded Systems, Embedded Hardware: Processors, Memory, Peripherals, Embedded Software: Firmware, Drivers, and Application Software, Development Tools: Compilers, Debuggers, Emulators, Software Development Life Cycle (SDLC) in Embedded Systems.	[6]
Unit 4: Embedded System Design & Development Embedded System Design Process, Requirement Analysis and Specification Writing Embedded System Modeling and Design Tools (UML, SysML), Hardware and Software Co-design, Firmware Development and Testing Strategies, Embedded System Performance Analysis, Case Study: Design of a Real-Time Temperature Monitoring System.	[6]





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Unit 5: Real-Time Operating Systems (RTOS) Introduction to RTOS: Differences from General OS, Task Scheduling: Cooperative vs. Preemptive Scheduling, Multithreading, Inter-Process Communication (IPC) Synchronization Mechanisms: Mutexes, Semaphores, RTOS-based Design Considerations Case Study: RTOS-Based Traffic Light Controller.	[6]
Unit 6: Power Optimization, Reliability, and Safety in Embedded Systems Fault Tolerance and Reliability in Embedded Systems, Power Optimization Techniques in Microcontrollers, Watchdog Timers and Reset Mechanisms, Embedded System Testing and Debugging, Safety Standards: ISO 26262 (Automotive), DO-178C (Aerospace)	[6]
Text Books: 1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, The 8051 Microcontroller and Embedded Systems, Pearson Education. 2. Raj Kamal, Embedded Systems: Architecture, Programming and Design, McGraw Hill. 3. Joseph Yiu, The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors, Elsevier	
Reference Books: 1. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Elsevier. 2. Frank Vahid, Tony Givargis, Embedded System Design: A Unified Hardware/Software Introduction, Wiley. 3. David E. Simon, An Embedded Software Primer, Pearson Education.	





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Object Oriented Programming

23EC3503	PCC	Object Oriented Programming	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Digital Electronics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop programs using object-oriented methodology in java.
CO2	Apply concept of inheritance for code reusability.
CO3	Develop program using multithreading.
CO4	Develop exception handling.
CO5	Develop programs for handling I/O and file streams.
CO6	Develop programs using graphics and applets.

Course Contents:

Unit 1: Basic Syntactical Constructs in Java Java features and java programming environment define class; create object and accessing members, java tokens, data types, and constants. Variables dynamic initialization array string type casting etc. Operators, expression Operator precedence, evaluation of expression, mathematical functions. Decision making and looping–If, If-Else, nested If-Else. Switch case Conditional operator, while loop, do-while loop, for loop, Continue, return keywords, nesting loops	[6]
Unit 2: Derived Syntactical Construct in Java Constructors and Methods, Types of constructors, Nesting of Methods, This keyword, command line argument. garbage collection, finalize () method, object Class. Visibility control –private, public and protected. Friendly private protected access, default, Examples of visibility control, Arrays and Strings – types of arrays, String classes and string buffers. Vectors, Wrapper classes and enumerated types.	[6]
Unit 3: Inheritance, Interface and Package Inheritance and its types, Types of inheritance Operator over loading and operator over riding Dynamic method dispatch. Final variable and method Using super abstract methods and classes, static members Interfaces –define, implement and access.	[6]



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Unit 4: Exception Handling and Multithreading Errors and Exception, types of errors Try, catch, nested try catch Throws, finally statement, build-in exception, creating own exception Examples of exception handling, Multithreaded programming–Creating threads–using extending thread class and runnable interface, Thread lifecycle–wait(), notify(), sleep(), suspend() ,stop().	[6]
Unit 5: Managing Input Output Files In Java Introduction and concept of stream, stream classes, By the stream classes, input stream classes, output stream classes Examples of file handling using stream classes Character stream classes Using File IO Class: IO exceptions, creation of files, reading and writing files Handling primitive data types Examples of handling primitive data types	[6]
Unit 6:Graphics in Java Introduction to applet-Applet, Applet Life Cycle. Example of Applet life cycle, html parameters and embedding Applet Graphics Programming–Classes, Line, Examples of graphic programming using Rectangles, circles, Examples of graphic programming using, arcs, polygons.	[6]
Text Books: 1. The complete Reference Java, Herbert Scheildt TMH. 2. Computer Programming in JAVA Junaid Khateel&Dr.G.T.Thampi Dream Tech Press. 3. Core JAVA for Beginners Sharnam Shah & Vaishali Shah SPD.	
Reference Books: 1. Programming in JAVA a primer E Balagurusamy TMH. 2. Programming in JAVA Sachin Malhotra, Saurabh Chaudhary Oxford University Press.	





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Program Elective Course-I

23EC3504A	PEC	Fuzzy Logic and Neural Network	3-0-0	3Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Physics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Compare different Neural Network model.
CO2	Analyze various techniques in feedback and feed forward neural network.
CO3	Apply the concept of fuzziness involved in various systems.
CO4	Classify knowledge of application of fuzzy logic control to real time systems.

Course Contents:

Unit 1: Architecture of Neural Networks

Introduction to Neural Networks, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

[6]

Unit 2: Essentials of Artificial Neural Networks

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

[6]

Unit 3: Single Layer Feed Forward Neural Networks

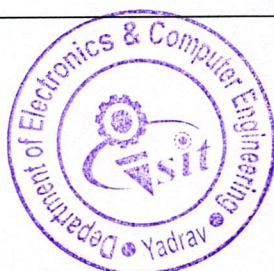
Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications. Multilayer Feed forward Neural Networks: Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

[6]

Unit 4: Classical & Fuzzy Sets

Introduction to fuzzy logic, classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

[6]



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Unit 5: Fuzzy Logic System Components Fuzzification, Membership value assignment, development of rule base and decision-making system, Defuzzification to crisp sets, Defuzzification methods,	[6]
Unit 6: Applications Neural network Applications: healthcare, business, forecasting, image processing and compression. Fuzzy logic: Medicine and Economics.	[6]
Text Books: 1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication. 2. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH, 2006 3. Fuzzy logic and Neural Networks ,M Amirthavalli, SCITECH publication	
Reference Books 1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002. 2. Neural Networks and Learning Machines – Simon Haykins , Pearson Education 3. Neural Engineering by C. Eliasmith and CH. Anderson, PHI 4. Neural Networks and Fuzzy Logic System by Bart Kosko, Pearson Education.	



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Program Elective Course-I

23EC3504B	PEC	Network Theory	3-0-0	3Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Physics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Classify network elements & apply mesh & node analysis.
CO2	Make use of network theorems to analysis linear circuits.
CO3	Determine two port network parameters & interrelation between parameters.
CO4	Apply graph theory to analyse network topology and develop associated matrices, including incidence matrix, fundamental loop and cutset matrices.
CO5	Apply Laplace transform to find transient response as RLC circuit.
CO6	Design and analysis different filters.

Course Contents:

Unit 1: Basic Concepts Basic Electrical Elements, Classification of Network Elements, Energy and Power in Network elements, Mesh and Node Analysis: Loop and Node Analysis with Dependent and independent sources, Super Mesh and Super Node Analysis.	[6]
Unit 2: Network Theorems Maximum Power Transfer Theorem, Principle of Dual Networks, Analysis of Networks using Superposition theorem, Reciprocity Theorem, Thevenin's Theorem, Norton's Theorem, Millman's Theorem.	[6]
Unit 3: Two port Network Two port networks (z, y) Two port networks parameters, interrelationship between parameters, cascade connection of two port networks.	[6]
Unit 4: Network Topology Basic Terminology: Graph, Types of Graphs, Planar and Non-Planar Graph, Tree, Co-tree, Matrices Associated with Network Graphs: Incidence Matrix, Fundamental Loop Matrix, Fundamental Cutset Matrix with examples.	[6]



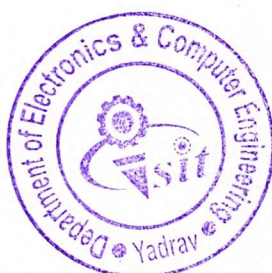
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Unit 5: Transient Analysis Behavior of circuit elements under switching condition and their Representation, Evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations with Laplace transforms.	[6]
Unit 6: Filters Definitions, classification & characteristics of different filters, filter fundamental such as attenuation constant, phase shift, propagation constant, characteristic impedance, decibel, neper. Design & analysis of constant K, M derived & composite filters (low pass, high pass, band pass & band stop filters): T & Pi sections.	[6]
Text Books: 1. A. Sudhakar, Shyammohan S. Palli 'Circuit & Network – Analysis & Synthesis' IIIrd Edition – Tata McGraw Hill Publication (Unit II, IV, V) 2. A. Chakrabarti 'Circuit Theory (Analysis & Synthesis)' - IIIrd Edition (Unit I, II) Dhanpat Rai & co 3. D. Roy Choudhury 'Networks & Systems' - New Age International Publisher (Unit I, II, III) 4. Soni Gupta 'Electrical Circuit Analysis' Dhanpat Rai & Co. (Unit III, IV, V, VI)	
Reference Books: 1. William H Hayt, Jack E Kimmerly and Steven M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill 2. M. E. Van Valkenburg 'Network Analysis' – IIIrd Edition, Pearson Education / PHI 3. Joseph Edminister 'Theory & Problems of Electronic Circuit (Schaum's series) – Tata McGraw Hill, Publication 4. R. G. Kaduskar, S. O. Rajankar, T. S. Khataavkar, Network Fundamentals and Analysis – Wile	





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Program Elective Course-I

23EC3504C	PEC	Object Oriented Analysis and Modelling	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

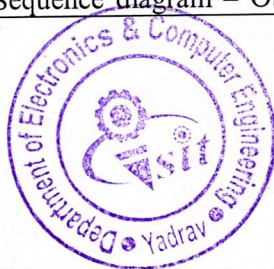
Pre-Requisites: Software Engineering.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the basic concepts of object-oriented modeling & its representations concepts.
CO2	Illustrate class modeling concepts.
CO3	Illustrate object modeling.
CO4	Explain basic behavioral modelling.
CO5	Apply advanced behavioral modelling concepts on data.
CO6	Make use of architectural modelling for presentation of data.

Course Contents:

Unit 1: Importance of Modeling Object Orientation -Object Oriented Development and Themes - OO methodology, Three Models, OO Themes: Abstraction, Encapsulation, combining data and behavior, Modeling as Design techniques - Brief overview of OMT by Rumbaugh, Importance of Modeling, Four principles of Modeling, Introducing the UML – overview, conceptual model, architecture, software development lifecycle	[6]
Unit 2: Class Modeling: Object and Class Concepts Objects, Classes, Class Diagrams, Values and Attributes, Operations and Methods, Link and Association concepts -Links and Associations, Multiplicity, Association and Names, Ordering, Association Classes, Qualified Association, Generalization, and Inheritance -Use of Generalization, Sample Class Model.	[6]
Unit 3: Class Modeling: Multiplicity, Aggregation and Object Modeling, Multiplicity, Aggregation, Aggregation Versus Association, Propagation of operations, Multiple Inheritance, Metadata and Constraints-Metadata, Constraints on objects and links, Object modeling, Object instances, Sample Object Model	[6]
Unit 4: Basic Behavioral Modeling Use case Diagram: Notations for Use case diagram – use cases, Actors, Communication lines, System boundaries, Usecase relationships - Include and extend, Use case generalization, Sample use case diagrams Sequence Diagrams: Notations for Sequence diagram – Objects/ Participants, Time, events,	[6]



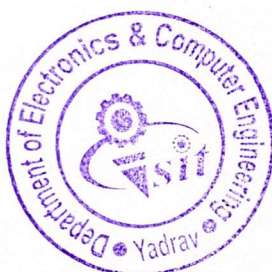
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Activation Bars, signals, message arrows, synchronous and asynchronous messages, return message, create and destroy message, Structured control – optional, conditional, parallel, loop execution, Sample sequence diagrams	
Unit5: Advanced Behavioral Modeling Activity Diagram: Notations for Activity Diagram – Actions and Activity nodes, initialization and completion, Decisions, Join and fork, Doing multiple tasks at the same time -Swim lanes, Sample Activity Diagram State Diagram, Notations for State diagram – initial state, final state, transitions and conditions, activity, event, Nested state diagram, concurrent / composite state diagram, Sample state diagram.	[6]
Unit6: Architectural modeling Component Diagram: Notations for component Diagram – component and interfaces, ports, connectorsSample Component Diagram Deployment Diagram: Notations for Deployment diagram – nodes, artifacts, node instances, communication between nodes, Sample Deployment diagram	[6]
Text Books: 1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. 2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007. 3. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3 rd Edition, Pearson Education, 2007.	
Reference Books 1. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009. 2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley-Dreamtech India, 2004. 3. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2 nd Edition, Tata McGraw-Hill, 2002	





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Digital Signal Processing Laboratory				
23EC3505	PCC	Digital Signal Processing Laboratory	0-0-2	1 Credits

Teaching Scheme:	Evaluation Scheme:
Practical: 2hrs/week	CA-I: 15 Marks CA-II: 15 Marks End Semester Exam: 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Demonstrate elementary signals /waveforms and perform the mathematical operation on discrete signals.
CO2	Apply Fourier series, Fourier transform and z transform on different signal
CO3	Determine the magnitude and phase response of DFT, Inverse DFT
CO4	Design IIR and FIR filter using window techniques.

Experiment List:

01.	To construct a program to plot the following continuous time and discrete time Signals. i. Step Function ii. Impulse Function iii. Exponential Function iv. Ramp Function v. Sine Function
02.	To compose a program for some basic operations like addition, subtraction, shifting and folding on signal
03.	To construct a program to generate Fourier series of a Square Wave.
04.	Evaluate Z Transform of given Signal
05.	To find the DFT/IDFT of a sequence without using the inbuilt functions.
06.	To identify Circular Convolution for given sequence.
07.	To design Low Pass IIR filter for given sequence.
08.	To design High Pass IIR filter for given sequence.
09.	To develop Low Pass FIR filter for given sequence.
10.	To develop of High Pass FIR filter for given sequence.



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Embedded System Laboratory				
23EC3506	PCC	Embedded System Laboratory	0-0-2	1Credits

Teaching Scheme:	Evaluation Scheme:
Practical: 2hrs/week	CA-I: 15 Marks CA-II: 15 Marks End Semester Exam: 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop knowledge about fundamentals of microcontrollers and Embedded system and its operation.
CO2	Develop Programming skills in embedded systems for various applications.
CO3	Demonstrate serial communication and porting of RTOS on an ARM-based controller."

Experiment List:

01.	Introduction to Microcontroller and Embedded System
02.	Program for turning ON LEDs sequentially using Microcontroller
03.	Program for controlling DC Motor using Microcontroller
04.	Program for controlling stepper Motor using Microcontroller.
05.	a. Program for generating saw-tooth wave using DAC.
05.	b. Program for generating sine wave using DAC.
06.	Program for Polled Loops
07.	Program for Rate Monotonic Scheduling
08.	Program for Earliest Deadline Scheduling
09.	Program for Shared Memory Communication



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Object Oriented Programming Laboratory

23EC3507	PCC	Object Oriented Programming Laboratory	0-0-2	1Credits
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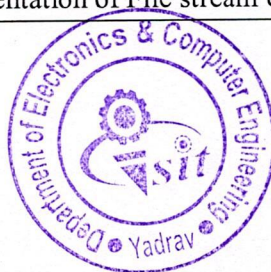
Teaching Scheme:	Evaluation Scheme:
Practical: 2 hrs/week	CA-I: 15 Marks CA-II: 15 Marks End Semester Exam: 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Interpret the java programming environments
CO2	Develop a program to demonstrate use of decision making and Looping
CO3	Apply programming skills for handling I/O, file streams, graphics and applets.

Experiment List:

01.	Develop program to demonstrate use of IF statement and its different forms.
02.	Develop programs to demonstrate use of a) Switch Case statement b) Conditional If()
03.	Develop programs to demonstrate use of looping statement ‘_for’
04.	Develop programs to demonstrate use of _while‘ , _do while‘
05.	a) Develop program for implementation of constructor. b) Develop program for implementation of multiple constructors in a class.
06.	Develop program for implementation arrays in java.
07.	Develop program for implementation vectors in java.
08.	Develop program for implementation wrapper class.
09.	Develop program which implements concept of overriding.
10.	Develop program which implement single and multilevel inheritance.
11	Develop minimum two basic applets. Display output with applet viewers and graphics. a) Develop program on basic applet. b) Develop a program using control loops in applets
12	Write a program to create animated shape using graphics and applets.
13	Develop a program to draw following shapes, graphics and applets a) Cone b) Cylinders c) Cube d) Square inside a circle e) Circle inside a square
14	Develop a program to implementation of I/O stream classes.
15	Develop a program to implementation of File stream classes.



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Mini Project-III

23EC3508	CEP	Mini Project III-Hackathon	0-0-2	1 Credit
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Teaching Scheme:	Evaluation Scheme:
Practical:2Hrs/week	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites: Mini Project, Mini Project II.

Course Outcomes: At the end of the course, students will be able to:

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the methods /tools used to develop the solution
CO4	Design / simulate the model/ project work
CO5	Summarize the solution with help of a project report and presentation

About Hackathon:

The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms where students will solve real world challenges. This Course focuses on the selection of methods/engineering tools/analytical techniques for problem solving.

Through this course, students will gain the understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills and responsibility

Course Contents:

Week 1: Survey Design-1 • Ensure case study group students have made necessary communication and done a preparatory visit. • Watch the lecture on survey design and study the notes. • Prepare a questionnaire and try it out with your group members as mock.	[2]
Week 2: Survey Design-2 • Review survey questionnaire prepared by case study groups. • Decide sampling strategy. • Prepare a detailed schedule for fieldwork	[2]
Week 3: Fieldwork • Data Collection: Collect quantitative data (e.g., statistics, usage metrics) and qualitative data (e.g., user stories, testimonials). • Use data collection tools like questionnaires, observation checklists, and digital analytics. • Ensure data accuracy and reliability through proper sampling and recording methods.	[2]



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• 25% Presentation has to be conducted by mentor/guide based on above activity	
Week 4: Trails and Experimentation-1 • Initial Setup and Configuration • Concept Validation • Feasibility Testing	[2]
Week 5: Trails and Experimentation-2 • Prototyping • Functionality Testing	[2]
Week 6: Trails and Experimentation-3 • Bug Identification and Fixing • Integration Testing • Security Testing • 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 7 : Results • Coordinator has to check and verify below points in term of result: • Functional Performance • Accuracy and Precision • Efficiency • Safety	[2]
Week 8: Validation • Coordinator has to check and verify below points in term of validation: • Testing and Verification • Compliance with Standards • 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 9: Integration Testing • Validate that the hardware integrates seamlessly with other systems or components as intended • Perform compatibility tests with software, other hardware, and network systems.	[2]
Week 10: Documentation and Reporting • Maintain comprehensive documentation of design, development, testing, and validation processes • Provide detailed reports on test results, issues found, and corrective actions taken.	[2]
Week 11: Final Presentation • 100% Presentation has to be conducted by mentor/guide based on above activity. • Prototype/Final Software solution is mandatory at the time of final presentation alongwith report.	[2]



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Industrial Training/Field Training-I				
23EC3509	INT/FT	Industrial Training/Field Training-I	0-0-0	Audit

Teaching Scheme:	Evaluation Scheme:
NA	End Semester Exam: 50 Marks

Course Description:

Internship / Training is educational and career development opportunity, providing practical experience in a field or discipline. At the end of the Fourth and Fifth semester, every student should under go practical training in an industry / professional organization / Research laboratory with the prior approval of the HOD/TPO/Principal of the college and submit the report along with the completion certification from the Industry/ Organization. There port will be evaluated during the Sixth semester by the department.

Course Outcomes: At the end of the course, students will be able to:

CO1	Show the Technical knowledge in real industrial situations.
CO2	Develop inter personal communication skills.
CO3	Discuss activities and functions of the industry in which the Internship/training has done.
CO4	Outline the technical report

About Hackathon

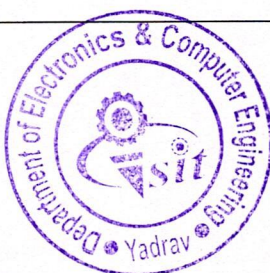
The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms where students will solve real world challenges. This Course focuses on the selection of methods/engineering tools/analytical techniques for problem solving.

Through this course, students will gain the understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills and responsibility

Prerequisite: -Basics of Computer Science Engineering, Good written and Oral Communication.

Guideline for Students::

01	Arrive at work as per schedule, ready to work and stay for the agreed up on time.
02	Always present your self in a professional manner, including being appropriately dressed at work place.
03	Communicate any concerns with your supervisor and the internship/Training coordinator in at timely manner and respectfully.
04	Demonstrate enthusiasm and interest in what you are doing, ask questions and take the initiative as appropriate.
05	Complete and submit assigned tasks by design at end timelines. Meet all deadlines.



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Student's Diary/Daily Log

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should recording the daily training diary the day today account of the observations ,impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed after every day by the supervisor/Incharge of the section where the student has been working. The diary should also be shown to the Faculty Mentor.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the SITCOE immediately after the completion of the training.

It will be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches and data recorded.
- Thought process and recording techniques used
- Organization of the information.

Internship Report

After completing the internship, the student should prepare a comprehensive report to indicate what he/she has observed and learned in the training period. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The competent authority should sign the training report.

The Internship report should be evaluated on the basis of following criteria:

- Originality.
- Adequacy and purposeful write-up.
- Organization, format, drawings, sketches, style, language etc.
- Variety and relevance of learning experience.
- Practical applications, relationships with basic theory and concepts taught in the course.

Evaluation of Internship/Training

- The student should be evaluated based on his training report and presentation, before an expert committee constituted by the concerned department as per norms. The evaluation will be based on the following criteria:
 - Quality of content presented.
 - Proper planning for presentation.
 - Effectiveness of presentation.
 - Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.



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Multidisciplinary Minor-III				
23ECMDA3	MDM	Control System	3-0-0	3Credits

Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Programable Logic Controller

Course Outcomes: At the end of the course, students will be able to:

CO1	Classify control systems and represent in various models.
CO2	Apply standard test signals to a system to determine their characteristics.
CO3	Make use of stability concepts to obtain the desired characteristics.
CO4	Determine the characteristics of a linear control system using various time and frequency domain tools.
CO5	Analyze the system behaviour using various stability analysis techniques and concept of controllers.
CO6	Classify control systems and represent in various models.

Course Contents:

Unit 1:Control System Modeling Basic Elements of Control System, Open loop and Closed loop systems, Differential equations and Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems, Block diagram reduction Techniques, Signal flow graph.	[6]
Unit 2: Time Response Analysis Standard input signals and its equation in s domain, Time response analysis of First Order Systems, Time response analysis of second order systems, Time response analysis of second order systems, Steady state errors and error constants, design specifications for second order systems.	[6]
Unit 3: Stability Analysis Concept of Stability, Necessary conditions for Stability, Routh-Hurwitz Criterion, Qualitative stability and conditional stability – limitations of Routh's stability, Relative Stability, Root Locus Technique, Construction of Root Locus, Dominant Poles, Application of Root Locus Diagram	[6]

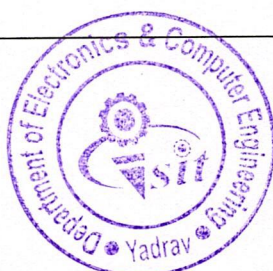


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Unit 4: Frequency Response Analysis Frequency domain Versus Time domain analysis and its correlation, Bode Plots, Polar Plots, Development of Nyquist Plots using polar plot., Frequency Domain specifications from the plots, Stability analysis from plots.	[6]
Unit 5: State Variable Analysis State space advantages and representation, Transfer function from State space, physical variable form, phase variable forms, controllable canonical form, observable canonical form, Solution of homogeneous state equations, state transition matrix and its properties, computation of state transition matrix by Laplace transform method only, Concepts of Controllability and Observability	[6]
Unit 6: Controllers and Digital Control Systems Introduction to PLC: Block schematic, PLC addressing, any one application of PLC using Ladder diagram, Introduction to PID controller: P, PI, PD and PID Characteristics and concept of Zeigler-Nicholas method. Digital control systems: Special features of digital control systems, Necessity of sample and hold operations for computer control, z-transform and pulse transfer function, Stability and response of sampled-data systems.	[6]
Text Books: 1. N. J. Nagrath and M. Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2009.	
Reference Books: 1. Benjamin C. Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition, 1995. 2. M. Gopal, "Control System – Principles and Design", Tata McGraw Hill, 4th Edition, 2012. 3. Schaum's Outline Series, "Feedback and Control Systems" Tata McGraw-Hill, 2007. 4. John J. D'Azzo & Constantine H. Houpis, "Linear Control System Analysis and Design", Tata McGraw-Hill, Inc., 1995.	





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23ECMDB3	MDM	Data Science and Its Application	3-0-0	3Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

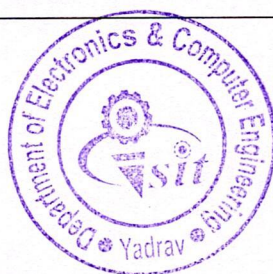
Pre-Requisites: Basic programming knowledge (preferably Python), foundational mathematics and statistics

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain basics of data science and data science workflow
CO2	Apply techniques for cleaning and transforming data and visualize data to identify patterns and trends.
CO3	Apply basic statistical methods to analyze data
CO4	Explain the basic concepts of machine learning
CO5	Utilize appropriate visualization techniques to communicate complex data patterns and relationships effectively.
CO6	Apply data science concepts to real-world projects

Course Contents:

Unit 1: Introduction to Data Science and Data Science Workflow What is Data Science, Types of Data: Structured, Unstructured, Semi-structured, Overview of Data Science Workflow: Data Collection, Cleaning, Exploration, Modeling, Evaluation, Introduction to Python and R for Data Science, Tools for Data Science: Jupyter Notebooks, Pandas, Matplotlib, Scikit-learn	[6]
Unit 2: Data Exploration and Preprocessing Data Cleaning: Handling Missing Data, Outliers, and Duplicates, Data Transformation: Normalization, Scaling, Encoding Categorical Data, Data Wrangling with Pandas, Data Visualization: Using Matplotlib and Seaborn, Descriptive Statistics (Mean, Median, Mode, Variance, Standard Deviation)	[6]
Unit 3: Statistical Methods in Data Science Probability Theory Basics, Inferential Statistics: Hypothesis Testing, p-values, Confidence Intervals, Correlation and Causality, Linear Regression and its Statistical Foundations.	[6]
Unit 4: Introduction to Machine Learning Overview of Machine Learning: Supervised vs Unsupervised Learning, Classification Algorithms: Logistic Regression, Decision Trees, Regression Algorithms: Linear Regression, Ridge, Lasso, Model Evaluation: Confusion Matrix, Accuracy, Precision, Recall, F1-score	[6]



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Unit 5:Data Visualization and Communication Principles of Effective Data Visualization, Creating Interactive Visualizations with Plotly and Dash, Communicating Data Science Findings: Storytelling with Data Visualizing Multivariate Data.	[6]
Unit 6:Real-World Data Science Applications and Project Case Study 1: Customer Segmentation using K-means Clustering, Case Study 2: Predicting House Prices using Regression, End-to-End Project: From Data Collection to Model Deployment, Ethical Considerations in Data Science	[6]
Text Books: 1. "Python for Data Analysis" by Wes McKinney 2. "Data Science for Business" by Foster Provost and Tom Fawcett 3. "Data Wrangling with Pandas" by Jacqueline Kazil	
Reference Books: 1. "Practical Statistics for Data Scientists" by Peter Bruce, Andrew Bruce, Peter Gedeck 2. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron 3. "Storytelling with Data" by Cole Nussbaumer Knaflic	





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23ECMDC3	MDM	Control System	3-0-0	3Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Programable Logic Controller

Course Outcomes: At the end of the course, students will be able to:

CO1	Classify control systems and represent in various models.
CO2	Apply standard test signals to a system to determine their characteristics.
CO3	Make use of stability concepts to obtain the desired characteristics.
CO4	Determine the characteristics of a linear control system using various time and frequency domain tools.
CO5	Analyze the system behaviour using various stability analysis techniques and concept of controllers.
CO6	Classify control systems and represent in various models.

Course Contents:

Unit 1:Control System Modeling Basic Elements of Control System, Open loop and Closed loop systems, Differential equations and Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems, Block diagram reduction Techniques, Signal flow graph.	[6]
Unit 2: Time Response Analysis Standard input signals and its equation in s domain, Time response analysis of First Order Systems, Time response analysis of second order systems, Time response analysis of second order systems, Steady state errors and error constants, design specifications for second order systems.	[6]
Unit 3: Stability Analysis Concept of Stability, Necessary conditions for Stability, Routh-Hurwitz Criterion, Qualitative stability and conditional stability – limitations of Routh's stability, Relative Stability, Root Locus Technique, Construction of Root Locus, Dominant Poles, Application of Root Locus Diagram	[6]
Unit 4: Frequency Response Analysis Frequency domain Versus Time domain analysis and its correlation, Bode Plots, Polar Plots, Development of Nyquist Plots using polar plot., Frequency Domain specifications from the plots, Stability analysis from plots.	[6]



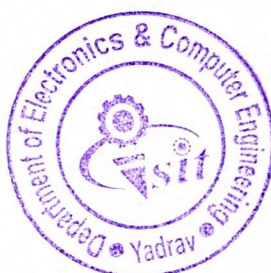
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Unit 5: State Variable Analysis State space advantages and representation, Transfer function from State space, physical variable form, phase variable forms, controllable canonical form, observable canonical form, Solution of homogeneous state equations, state transition matrix and its properties, computation of state transition matrix by Laplace transform method only, Concepts of Controllability and Observability	[6]
Unit 6: Controllers and Digital Control Systems Introduction to PLC: Block schematic, PLC addressing, any one application of PLC using Ladder diagram, Introduction to PID controller: P, PI, PD and PID Characteristics and concept of Zeigler-Nicholas method. Digital control systems: Special features of digital control systems, Necessity of sample and hold operations for computer control, z-transform and pulse transfer function, Stability and response of sampled-data systems.	[6]
Text Books: 1. N. J. Nagrath and M.Gopal, “Control System Engineering”, New Age International Publishers, 5th Edition, 2009.	
Reference Books: 1. Benjamin C. Kuo, “Automatic control systems”, Prentice Hall of India, 7th Edition, 1995. 2. M. Gopal, “Control System – Principles and Design”, Tata McGraw Hill, 4th Edition, 2012. 3. Schaum’s Outline Series, “Feedback and Control Systems” Tata McGraw-Hill, 2007. 4. John J. D’Azzo & Constantine H. Houpis, “Linear Control System Analysis and Design”, Tata McGraw-Hill, Inc., 1995.	

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Aptitude Skill III

23HSSM05	VEC	Aptitude Skill III	1-0-0	Audit
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Teaching Scheme:	Evaluation Scheme:
Lecture: 1hr/week	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites: Programmable Logic Controller

Course Outcomes: At the end of the course, students will be able to:

CO1	Solve the problems on system of equation.
CO2	Solve the problems on seating arrangement.
CO3	Solve the logical reasoning problems.
CO4	Solve the critical analysis problems.
CO5	Solve the problems of Data interpretation.
CO6	Solve the problems of permutations and Combinations

Course Contents:

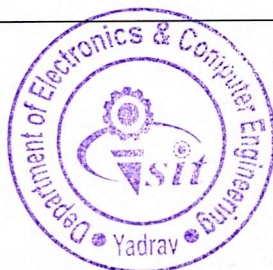
Unit1: System of equations quadratic equations, Surds and indices, solution of equations, Ages.	[2]
Unit2: Seating Arrangements Linear seating Arrangement, Circular seating arrangement, Complex seating arrangement	[2]
Unit.3: Logical Reasoning Numerical based on sense of direction, Blood relations, Odd man Out	[2]
Unit 4:Critical analysis Clocks and Calendar based problems, Crypt arithmetic, heights and distances	[2]
Unit5: Data Interpretation Table form, Bar form, Line for Pi chart form.	[2]
Unit 6: Permutation and combination Permutation and combinations	[2]

Text Books:

1. RS Aggarwal "A Modern Approach to Verbal & Non-Verbal Reasoning ",S. Chand Publisher; 2016 edition.
2. RS Aggarwal, " Quantitative Aptitude for Competitive Examinations ", S. Chand Publisher; 2016 edition.
3. Raymond Murphy "Essential English Grammar with Answers", Murphy

Reference Books:

1. Rao N,D,V,Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press;Second edition.



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3. RS Aggarwal, Objective General English, S. Chand Publisher; 2016 edition



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Language Skill -III

23HSSM06	VEC	Language Skill -III	0-0-2	Audit
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 hrs/week	CA-I: 25 Marks CA-II: 25 Marks

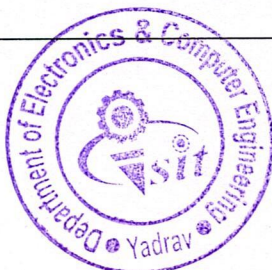
Pre-Requisites:Programable Logic Controller

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop a program to read input and return output.
CO2	Develop a program using data types, Strings and variables.
CO3	Develop a program using Unary, Binary and Ternary operator.
CO4	Develop a program using Conditional and Logical statements.

Course Contents:

1. Write a Python program to print "Hello, World!" Objective: Understand basic syntax, indentation, and output.	[2]
2. Write a program to demonstrate the use of different types of comments in Python. Objective: Single-line and multi-line comments.	[2]
3. Write a Python program that declares different types of variables and displays their data types using the type() function. Objective: Variables, data types, and type identification.	[2]
4. Write a program to demonstrate type casting and type conversion between int, float, and string. Objective: Type conversion, casting functions.	[2]
5. Write a Python script to perform string operations such as slicing, concatenation, upper(), lower(), and len(). Objective: String manipulation and built-in functions.	[2]
6. Write a program to demonstrate the use of all arithmetic, logical, and bitwise operators. Objective: Operator functionality.	[2]
7. Write a Python program to use membership and identity operators with examples. o Objective: in, not in, is, is not.	[2]
8. Write a Python program using a ternary operator to find the larger of two numbers. Objective: Conditional (inline) expressions.	[2]
9. Write a program that takes user input for age and prints whether the person is a child, teenager, adult, or senior citizen using if-elif-else. Objective: Conditional statements and user input.	[2]
10. Write a program to find the sum of the first 10 natural numbers using a while loop. Objective: Looping with while.	[2]



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11. Write a Python script to display the multiplication table of a number using a for loop. Objective: Looping with for and range().	[2]
12. Write a program that uses break, continue, and pass statements in appropriate looping scenarios. Objective: Loop control statements.	[2]





Department: Electronics and Computer Engineering

Rev: Course Structure/01/NEP/2023-24

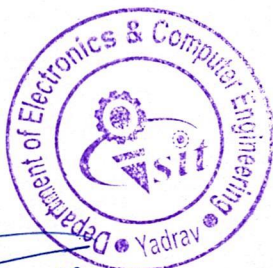
Class: T.Y.B. Tech

Semester: VI

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
23EC3601	PCC	Electromagnetic Theory and Antenna	3	-	-	3	10	10	30	50	100	3
23EC3602	PCC	Database Management System	3	-	-	3	10	10	30	50	100	3
23EC3603	PCC	Internet of Things	3	-	-	3	10	10	30	50	100	3
23EC3604	PEC	Program Elective Course-II	3	-	-	3	10	10	30	50	100	3
23EC3605	PCC	Internet of Things Laboratory	-	-	2	2	15	15	-	20	50	1
23EC3606	PCC	Database Management System Laboratory	-	-	2	2	15	15	-	20	50	1
23EC3607	VSEC	Android Application Development	-	-	2	2	25	25	-	-	50	1
23EC3608	VEC	Constitution of India	1	-	-	1	25	25	-	-	50	Audit
23EC3609	PROJ	Capstone Project-I	-	-	4	4	25	25	-	50	100	2
23ECMDXX	MDM	Multidisciplinary Minor-IV	3	-	-	3	10	10	30	50	100	3
23HSSM07	VEC	Aptitude Skills- IV	1	-	-	1	25	25	-	-	50	Audit
23HSSM08	VEC	Language Skills- IV	-	-	2	2	25	25	-	-	50	Audit
		Total	17	-	12	29	205	205	150	340	900	20

Biomedical Engineering (BasketA)	Data Science (BasketB)	Industrial Automation (BasketC)
Biomedical Instrumentation (23ECMDA4)	Data Visualization (23ECMDB4)	SCADA system for Automation (23ECMDC4)

Program Elective Course -II	A. Wireless Communication
	B. Artificial Intelligence
	C. Information Theory and Coding



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Electromagnetic Theory and Antenna

23EC3601	PCC	Electromagnetic Theory and Antenna	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3Hrs/week	CA-1 :10 Marks CA 2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Good knowledge of Engineering Fundamentals of Physics and Electromagnetic.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain basics of Vector calculus & different laws in steady electric fields.
CO2	Define & derive different laws in magnetic fields.
CO3	Explain Maxwell's equations in different forms.
CO4	Explain the radiation mechanism of an antenna and calculate antenna parameters
CO5	Compare the given wire antenna and its radiation characteristics
CO6	Explain the different types of antenna arrays.

Course Contents:

Unit 1: Vector Algebra and Electrostatics Review of vector Analysis and coordinate systems, Basic vector algebra-Dot product, Cross product, curl, divergence, Gradient. Coulomb's law & electric field, field due to distributed charges density, Gauss's law, divergence theorem, Electrostatic potential, electric dipole, Electrostatic energy density, Boundary conditions for electrostatic field	[6]
Unit 2: Steady Magnetic Field Biot Savart's law, Ampère's circuital law, Stoke's Theorem, Magnetic flux density and vector magnetic potential, Current carrying conductors in magnetic fields, Torque on loop, Energy stored in a magnetic field, Boundary conditions for magnetostatic field.	[6]
Unit 3: Maxwell's Equations Inconsistency of Ampere's law, Faraday's law, Maxwell's equations for static field, time-varying field and harmonically varying fields.	[6]
Unit 4: Antenna Basics Introduction, radiation mechanism, Basic Antenna parameters: Antenna pattern, Half power beam width, Beam area, Beam efficiency, Directivity and Gain, Radiation resistance, Resolution, Antenna aperture, Effective height, Front to Back ratio, polarization, Antenna aperture, Antenna field zones.	[6]
Unit 5: Wire Antennas Monopole and Dipole Antenna, Short Dipole, Loop Antenna, Yagi-Uda Antenna, V- antenna, Helical Antenna, Structural details, dimensions, radiation pattern, specifications, features, and applications.	[6]
Unit 6: Antenna Arrays	[6]





Arrays of two isotropic point sources: same amplitude and phase, same amplitude and opposite phase, same amplitude and any phase difference, Linear arrays of n isotropic point sources of equal amplitude and spacing, Broadside Array, End fire Array.

Text Books:

1. Microwave Engineering – Annapurna Das, Sisir K Das TMH Publication, 2nd, 2010
2. Antennas and Wave Propagation, John D. Krauss, Ronald J Marhefka, and Ahmad S Khan, 4th Special Indian Edition, McGraw- Hill Education Pvt. Ltd., 2010.
3. Antennas and Wave Propagation – Harish and Sachidananda: Oxford University Press, 2007.
4. G.S.N. Raju, "Antenna and Wave Propagation", Pearson Education.
5. Sadiku, "Elements of Electromagnetics", 4th edition, Oxford University Press.
6. G.S.N. Raju, "Electromagnetic field theory & Transmission lines", 1st edition, Pearson Education.

Reference Books:

1. Microwave Devices and circuits- Liao / Pearson Education
2. Microwave Engineering – David M Pozar, John Wiley India Pvt. Ltd., 3rdEdn, 2008
3. Microwave Engineering – Sushrut Das, Oxford Higher Education, 2ndEdn, 2015
4. John D. Kraus, "Electromagnetics", Tata McGraw Hill Publication.
5. William Hayt, Buck, "Engineering Electromagnetics", Tata McGraw Hill Publication.
6. Jordan & Balmain, "Electromagnetic Fields & Radiation Systems", 2nd edition, PHI.





Database Management System

23EC3602	PCC	Database Management System	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3Hrs/week	CA-1 :10 Marks CA 2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Computer Network

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the basic database concepts of DBMS, applications, data models, schemas and instances.
CO2	Illustrate use of constraints and relational algebra operations for building applications
CO3	Make use of the basics of SQL and construct queries using SQL in database creation and interaction.
CO4	Construct different normalization techniques in databases.
CO5	Illustrate concepts of indexing and hashing
CO6	Choose different strategies for providing security, privacy, control, backup and recovery of data.

Course Contents:

Unit 1: Introduction Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS, View of Data, Data Models, Database Architecture, , The Entity-Relationship Model-Constraints, keys, E-R Diagrams. Weak Entity Sets, Extended E-R features.	[6]
Unit 2: Relational Model Structure of relational Databases, Database Schemas, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations. Calculus vs Algebra.	[6]
Unit 3: Introduction to SQL SQL Data Definition Language, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database, Join Expressions, Views, Integrity Constraints, and Accessing SQL from a Programming triggers.	[6]
Unit 4: Relational Database Design The purposes of Normalization, Data Redundancies and Update Anomalies, Functional Dependencies- types of functional dependency, closure of set of functional dependency, canonical cover, The Process of Normalization, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.	[6]
Unit 5: File Organization Indexing and Hashing	[6]



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Overview of File Organization, Organization of Records in Files, Data-Dictionary Storage, Database Buffer. Basic Concepts of Indexing and Hashing, Ordered Indices, B+-Tree Index Files, B-Tree Index Files, Multiple-Key Access, Static Hashing, Query Processing-Overview, and Measures of Query cost, Evaluation of relational algebra operations, Query optimization.	
Unit 6: Transaction management and Concurrency control Transaction concept, A simple transaction model, ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping model, Recovery systems-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, checkpoint, Shadow paging.	[6]
Text Books: 1. "Database System Concepts", Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 6th edition, McGraw- Hill. 2. "Database Systems - A Practical Approach to Design, Implementation and Management", Thomas Connolly, Carolyn Begg, 4th Edition, Addison Wesley. 3. "MySQL Cookbook", Paul Du Bois, 3rd edition, O'REILLY.	
Reference Books: 1. "Fundamentals of Database Systems", Ramez, Elmasri, Shamkant B. Navathe, 6th Edition, Addison, Wesley. 2. "Database Systems – Design, Implementation and Management", Rob & Coronel, 5th Edition, Thomson Course Technology.	





Internet of Things

23EC3603	PCC	Internet of Things	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3Hrs/week	CA-1 :10 Marks CA 2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Computer Network

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the fundamentals of IoT
CO2	Make use of sensors and actuators for design of IoT
CO3	Apply various protocols for design of IoT systems
CO4	Compare Various IP protocols for IoT
CO5	Demonstrate the ability to program Arduino-based systems using IDE, libraries, and emulator tools for IoT applications.
CO6	Develop applications based on IoT.

Course Contents:

Unit 1: Introduction to IoT Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.	[6]
Unit 2: Hardware for IoT Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, Netduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	[6]
Unit 3: Network & Communication aspects in IoT WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus.	[6]
Unit 4: IoT Data Protocols Message Queue Telemetry Transport, Constrained Application Protocol, Advanced Message Queuing Protocol Data Distributed Services, Representational State Transfer, Extensible Messaging and Presence Protocol.	[6]
Unit 5: Programming the Arduino Arduino Platform Boards Anatomy, Arduino IDE, coding, using emulator, using libraries, additions in Arduino, programming the Arduino for IoT.	[6]
Unit 6: Challenges and Applications in IoT Development Challenges, Security Challenges, Other challenges, IoT Applications: Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart	[6]





cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.

Text Books:

1. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things key applications and protocols", Wiley
2. Jeeva Jose, Internet of Things, Khanna Publishing House
3. Michael Miller "The Internet of Things" by Pearson
4. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
5. Hakima Chaouchi, — The Internet of Things Connecting Objects to the Web ISBN : 978-1-84821-140-7, Wiley Publications
6. Vijay Madiseti and Arshdeep Bahga, —Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.

Reference Books:

1. Arshdeep Bahga, Vijay Madiseti "Internet of Things (A hands on approach)" 1ST edition, VPI publications, 2014
2. Adrian Mc Ewen, Hakin Cassimally "Designing the Internet of Things" Wiley India.
3. Daniel Minoli, —Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, ISBN: 978-1-118-47347-4, Wiley Publications
4. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press





Program Elective Course-II

23EC3604A	PEC	Wireless Communication	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3Hrs/week	CA-1 :10 Marks CA 2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Computer Network

Course Outcomes: At the end of the course, students will be able to:

CO1	Make use of concepts of wireless communication system and cellular radio system.
CO2	Explain the basics of mobile propagation models with large scale path loss.
CO3	Explain the basics of mobile propagation models with small scale fading.
CO4	List the various multiple access techniques used in wireless communication.
CO5	Explain the emerging trends in Wireless communication and related issues and challenges.

Course Contents:

Unit 1: Introduction to Wireless Communication System Introduction, Mobile Radio System around the world, Examples of Wireless communication System, Comparison of Common wireless system, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL), Wireless Local Area network (WLAN).	[6]
Unit 2: Cellular Radio Systems Basic cellular system, Components and Operation of cellular systems, Analog & Digital cellular systems, Concept of frequency reuse channels, Co-channel interference, Cell splitting.	[6]
Unit 3: Mobile Radio Propagation Model Large scale path loss:-Free Space Propagation loss equation, Path-loss of LOS systems, Reflection, Diffraction, Scattering, Indoor and outdoor propagation models.	[6]
Unit 4: Mobile Radio Propagation Model, Small Scale Fading Small scale multipath propagation, Impulse model for multipath channel, Types of small scale Fading, Rayleigh and rician distribution	[6]
Unit 5: Multiple Access Techniques Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code division Multiple access (CDMA), Spread Spectrum Multiple Access, GSM system architecture, GPRS system architecture.	[6]
Unit 6: Recent Trends Introduction, WiMAX, ZigBee Networks, Wireless Adhoc Network, Security issues and challenges in a Wireless network, 4G & 5G Mobile techniques and Emerging technologies.	[6]
Text Books: 1. Jochen Schiller, Mobile Communications, Pearson, 2008.	





2. Andreas F Molish, Wireless Communications, 2nd Edition, Wiley India Publications, 2013.
3. Wireless Communication, Theodore S. Rappaport, Prentice Hall.

Reference Books:

1. Jochen Schiller, Mobile Communications, Pearson, 2008
2. Andreas F Molish , Wireless Communications, 2nd Edition, Wiley India Publications, 2013
3. Wireless Communication, Theodore S. Rappaport, Prentice Hall
4. Wireless Communications and Networking, Vijay Garg, Elsevier
5. Wireless digital communication, Kamilo Feher, PHI
6. Mobile and personal Communication system and services by Rajpandya, IEEE press (PHI).
7. William C Y Lee, Mobile Cellular Telecommunications, 2nd Edition, MGH, 2004.
8. Raj Pandya, —Mobile and Personal Communication systems and services, Prentice Hall of India, 2001




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Program Elective Course-II

23EC3604B	PEC	Artificial Intelligence	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 Hrs/week	CA-1 :10 Marks CA 2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Fundamental of Probability and Statistics, Problem Solving and Data Structures

Course Outcomes: At the end of the course, students will be able to:

CO1	Illustrate history, foundation of AI and the structure of intelligent agents.
CO2	Explain informed and uninformed search strategies by understanding concept of logical agents.
CO3	Make use of the first order logic and its inference.
CO4	Analyze different planning algorithms and knowledge representation

Course Contents:

Unit 1: Introduction Introduction: What is Artificial Intelligence? Foundations of AI, history, the state of art AI today. Intelligent Agents: agents and environment, good behaviour, nature of environment, the structure of agents.	[4]
Unit 2: Searching Solving Problems by Searching: Problem solving agents, examples problems, searching for solutions, uninformed search, informed search strategies, heuristic functions.	[4]
Unit 3: Logical Agents Knowledge base agents, The Wumpus world, logic, propositional logic, propositional theorem proving, effective propositional model checking, agents based on propositional logic.	[4]
Unit 4: First Order Logic First Order Logic: Syntax and semantics, using First Order Logic, Knowledge engineering in First Order Logic. Inference in First Order Logic: propositional vs. First Order, unification and lifting, forward and backward chaining, resolution.	[4]
Unit 5: Planning Definition of Classical Planning, Algorithms for planning as state space search, planning graphs, hierarchical planning.	[4]
Unit 6: Knowledge Representation Categories and Objects, events, mental events and objects, reasoning systems for categories, reasoning with default information, Internet shopping world.	[4]
Text Books:	





Shri. Shamrao Patil (Yadravkar) Educational & Charitable Trust's

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1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill-2008
2. Dan W. Patterson,” Introduction to AI and ES”, Pearson Education, 2007.
3. Parag Kulkarni, Prachi Joshi, “ Artificial Intelligence building intelligent systems”, PHI

Reference Books:

1. Stuart Russel and Peter Norvig “AI–A Modern Approach”, 2nd Edition, Pearson Education 2007
2. Deepak Khemani “Artificial Intelligence”, Tat Mc Graw Hill Education 2013




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Program Elective Course-II

23EC3604C	PEC	Information Theory and Coding	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3Hrs/week	CA-1 :10 Marks CA 2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Understanding of analog and Digital Communication, Theory of Probability

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply probability theory for PDF and CDF, and assess entropy, information rate, and mutual information.
CO2	Explain the functioning of communication channels, the role of source coding, and the significance of channel capacity
CO3	Apply Coding theory for error detection and correction
CO4	Design generator and parity-check matrices for cyclic codes and Convolutional Codes

Course Contents:

Unit 1: Probability Theory and Random Process Introduction to digital communication system, probability and sample space, Bayes' rule, Joint & conditional Probability, PDF & CDF, Statistical averages, Random Variables, Random Processes, Time average, Ergodicity, Power Spectral density of Stationary random processes.	[6]
Unit 2: information theory Introduction, Concept of amount of information, Entropy-Definition and Properties, Marginal, Joint, and Conditional entropies, relation among entropies, information rate, Mutual Information, and properties. content of symbols in Long dependent sequences, Markov Statistical Model of Information Sources, Entropy and Information rate of Mark off Sources.	[6]
Unit 3: Communication Channels Channel Capacity, Redundancy and Efficiency of channel, Discrete memoryless channel – Classification of channels: Noise-free channel, Symmetric channel, Binary Symmetric Channel (BSC), Cascaded Channels and Binary Erasure Channel (BEC), Calculation of channel capacity, Shannon's fundamental theorem, Shannon-Hartley Theorem, Shannon Fano Coding, Huffman's Coding, Coding Efficiency Calculations.	[6]
Unit 4: Error Control Coding Introduction: Need for Error Control Coding, Classification, Error Detection and Error Correction Techniques, Coding Terminology, Matrix Description of Linear Block Code, Generator and Parity Check Matrices, Hamming Codes, Encoder and Syndrome decoder for (n, k) block Code, other Linear Block codes –Single Parity check bit code.	[6]
Unit 5: Cyclic Codes	[6]





Algebraic structure, Properties, Generator Polynomial, Generation of Code Vector in Nonsystematic and Systematic form, Generator and Parity check matrices, Encoding of Cyclic Code, Syndrome decoding for Cyclic code, Hardware Representation of (n,k) cyclic code.	
Unit 6: Convolutional Codes Introduction, Encoding of Convolutional Codes, Time Domain Approach, Transform Domain Approach, Graphical Approach – Code Tree, State diagram and Trellis Diagram, Decoding of Codes: Maximum Likelihood Decoding-Viterbi Algorithm, Sequential Decoding.	[6]
Text Books: 1. Simon Haykin, "Communication Systems ", John Wiley & Sons, Inc, IVth Edition, 2. R.P Singh & S.D. Sapre," Communication Systems Analog & Digital ",Mc-Graw Hill, 2nd Edition,2001. 3. Ranjan Bose "Information Theory Coding & Cryptography", Tata McGraw- Hill Publishing Company Ltd.	
Reference Books: 1. B. P. Lathi; Modern Digital and Analog Communication Systems; Oxford Publication 2. Taub, Schilling, Principles of Communication Engineering (2nd Edition), TMH. 3. Digital Communications- John G. Proakis, 5th ed., TMH 2008. 4. Thomas M. Cover, Joy A. Thomas, Elements of Information Theory, Wiley Inter science.	





Internet of Things Laboratory

23EC3605	PCC	Internet of Things Laboratory	0-0-2	1 Credit
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Teaching Scheme:	Evaluation Scheme:
Practical: 2Hrs/week	CA-1 :15 Marks CA 2 :15 Marks End Semester Exam: 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop the interfacing of IoT with Raspberry Pi.
CO2	Design utilizing state of the art hardware boards and software's as per industry standards
CO3	Make use of research activities in different application areas of IoT
CO4	Develop communication skills and capability to work in team

Minimum 08 Experiments should be Conducted.

Sr. No.	Name of the Experiments.
1	Demonstrate of At89S52Ultra Development it with Development Tool/ Environment of Keil Software for Microcontroller programming.
2	To familiarize with Intel Galileo Gen2 board and understand procedure of creation and compilation of C source code
3	WiFi module interfacing with Intel Galileo Gen2 board
4	To study of IoT Data Logging using Baeglebone Black and Thingspeak
5	To turn your smart phone into an IoT device using the IBM Watson IoT platform cloud - hosted service
6	Exercise on Eclipse IoT Project
7	Experiments on few Eclipse IoT Projects
8	Any experiment on architecture of IoT tool kit
9	Exercise on smart object API Gateway service reference implementation in IoT Toolkit
10	Experiment on HTTP to CoAP semantic mapping Proxy in IoT Toolkit.

Entire syllabus of IoT is changed & observed





Database Management System Laboratory

23EC3606	PCC	Database Management System Laboratory	0-0-2	1 Credit
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Teaching Scheme:	Evaluation Scheme:
Practical: 2Hrs/week	CA-1 :15 Marks CA 2 :15 Marks End Semester Exam: 20 Marks

Pre-Requisites: - Basic knowledge on programming and database concepts.

Course Outcomes: At the end of the course, students will be able to:

CO1	Demonstrate the use of constraints and relational algebra operations for building applications
CO2	Make use of the basics of SQL and construct queries using SQL in database creation and interaction.
CO3	Construct different normalization techniques in databases.

Minimum 08 Experiments should be Conducted.

Sr. No.	Name of the Experiments.
1	Study the basic concept of Database System and ER Model.
2	Installation of MySQL/Oracle and practice DDL commands. Create table • Alter table • Drop Table
3	Installation of MySQL/Oracle and practice DML commands Insert • Update • Delete
4	Implement Operations using Relational Algebra.
5	Implement Structured Query Language Creating Database • Creating a Database • Creating a Table • Specifying Relational Data Types • Specifying Constraints • Creating Indexes
6	Implement Aggregate Functions, Sub queries, Set operators.
7	Perform Nested and Join Queries, Cursors and Triggers, Functions and Procedures.
8	Implement the concept of Normalization.
9	To implement the concept of Indexing and Hashing for data retrieval.
10	Study & Implementation of Database Backup & Recovery command by using concurrency control protocols.
11	Data base connectivity techniques.
12	Design and implementation of a Database Application.





Android Application Development

23EC3607	VSEC	Android Application Development	0-0-2	1 Credit
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 Hrs/week	CA-1 :25 Marks CA -2 :25 Marks

Pre-Requisites: - Basic knowledge on programming and database concepts.

Course Outcomes: At the end of the course, students will be able to:

CO1	Design user interfaces for mobile apps using basic building blocks, UI components and application structure using Emulator
CO2	Construct a simple program and develop small applications using the concepts of UI design, layouts and preferences
CO3	Develop applications with multiple activities using intents, array adapter, exceptions and options menu.
CO4	Develop mobile applications using SQLite.

Course Contents:

Fundamentals: Basic Building blocks – Activities, Services, Broadcast Receivers and Content providers, UI Components – Views and notifications Components for communication -Intents and Intent Filters
Application Structure: AndroidManifest.xml, user-permission – sdk, Resources and R.java, Assets, Layouts and Drawable Resources, Activities and Activity lifecycle.
Emulator-Android Virtual Device: Launching emulator, Editing emulator settings, Emulator shortcuts, Logcat usage, Introduction to DDMS
Basic UI design: Form widgets, Text Fields, Validation of Edit Text, Layouts, [dip, dp, sip, sp] versus px
Preferences: Shared Preferences, Preferences from xml
Menu: Option menu, Context menu, menu from xml, menu via code
Intents: Explicit Intents, Implicit intents
UI design: Time and Date, Images and media, Android Adapter and List View, Composite, Alert Dialogs and Toast, Popup, Fragments, Navigation drawer
Tabs, Tab Activity Styles & Themes: styles.xml, drawable resources for shapes, gradients (selectors), style attribute in layout file, Applying themes via code and manifest file
Content Providers: SQLite Programming, SQLite Open Helper, SQLite Database, Cursor, Reading and updating Contacts, Reading bookmarks
Reference Books: 1. Joseph Annuzzi Jr, Lauren Darcey, Shane Condor, “Advanced Android Application Development, Developers Library”, Pearson Education, 4 th Edition (2015) 2. Lauren Darcey, Shane Condor, “Android, Wireless Application Development”, Pearson Education, 3 rd Edition.





3. Paul Deitel, Harvey Deitel, Alexander Wald, "Android 6 for programmers, An AppDriven Approach", Pearson Education
4. Rap Payne, "Beginning App Development with Flutter: Create Cross-Platform Mobile Apps", Apress (2019)

Sr. No.	Name of the Experiments.
1	Fundamentals – Basic building blocks
2	Application structure, layout and resources
3	Android Virtual Device, Activity Lifecycle
4	Basic UI Design and Edit Text Validation
5	Shared Preferences, Relative Layout, Frame Layout, Grid Layout and Preferences from xml
6	Array Adapter, List View and Exception handling
7	Various Menu options
8	Explicit and Implicit Intents
9	Images and media, Dialogs, Spinner component, Popups, Fragments, Navigation drawer
10	Applying themes and styles .xml
11	SQLite Programming





Constitution of India

23EC3608	VEC	Constitution of India	1-0-0	Audit
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Teaching Scheme:	Evaluation Scheme:
Lecture: 1Hrs/week	CA-1 :25 Marks CA 2 :25 Marks

Pre-Requisites: - Nil

Course Outcomes: At the end of the course, students will be able to:

CO1	Define the meaning and features of Indian constitution.
CO2	Interpret right to life and fundamental rights to certain free document under article 19 and 21.
CO3	Outline the federal structure of power and directive principles of state policy.

Course Contents:

Unit 1: Meaning of the constitutional and constitutionalism, Historical perspective of the Constitution of India.	[2]
Unit 2: Salient features and characteristics of the Constitution of India, Scheme of the fundamental rights, The scheme of the Fundamental Duties and its legal status	[2]
Unit 3: The Directive Principles of State Policy – Its importance and implementation, Federal structure and distribution of legislative and financial powers between the Union and the States, Parliamentary Form of Government in India– The constitution powers and status of the President of India	[2]
Unit 4: Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency	[2]
Unit 5: Local Self Government – Constitutional Scheme in India, Scheme of the Fundamental Right to Equality	[2]
Unit 6: Scheme of the Fundamental Right to certain Freedom under Article 19, Scope of the Right to Life and Personal Liberty under Article 21.	[2]

Reference Books:

1. Constitution of India Published by Government of India Ministry of Law and Justice (Legislative Department), 2020
2. Text book on The Constitution of India by S R Bhansali
3. Constitution of India by Bakshi P M, January 2014





Capstone Project-I

23EC3609	PROJ	Capstone Project-I	0-0-4	2 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 4Hrs/week	CA-I: 25 Marks CA-II :25 Marks End Semester Exam: 50 Marks

Pre-Requisites: - All courses

Course Outcomes: At the end of the course, students will be able to:

CO1	Choose the exact title of the project and define the problem
CO2	Explain the motivation, objectives and scope of the project.
CO3	Summarise the literature related to the selected topic of the project.
CO4	Design the mechanism, components of the system and prepare detailed drawings.
CO5	Evaluate the cost considering different materials/manufacturing processes.

The students in a group of not more than FOUR will work under the guidance of the faculty member on the project work undertaken by them.

The completion of work, the submission of their report and assessment should be done at the end of VII Sem.

The project work should consist of any of the following or appropriate combination:

1. A comprehensive and up-to-date survey of literature related to study of a phenomenon or product.
2. Design of any equipment and/or its fabrication and testing.
3. Critical Analysis of any design or process for optimizing the same.
4. Experimental verification of principles used in applications related to various specializations related to Mechanical Engineering.
5. Software development for particular applications.
6. A combination of the above.

It is expected that the students should complete at least 50% of the total project work in VI Semester. The objective is to prepare the students to examine any design or process or phenomenon from all angles, to encourage the process of independent thinking and working and to expose them to industry. The students may preferably select the project works from their opted elective subjects. The students should submit the report in a prescribed format, before the end of VII semester. The report shall be comprehensive and presented typed on A4 size sheets and bound. Number of copies to be submitted is number of students plus two. The assessment would be carried out by the panel of examiners for both, term work and oral examinations.




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Multidisciplinary Minor-IV

23ECMDA4	MDM	Biomedical Instrumentation	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3Hrs/week	CA-1 :10 Marks CA 2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: NIL

Course Outcomes: At the end of the course, students will be able to:

CO1	Outline the basic knowledge of anatomy and physiology of human body.
CO2	Understand & Analyze important vital sign parameters to evaluate certain disease.
CO3	Categorize the differences of bio-potentials and its characteristics
CO4	Design bio-potential fundamental circuits and implement it for demonstration.
CO5	Experiment with various medical bio potentials.
CO6	Analyze safety related to electrical hazards and troubleshooting of biomedical instruments.

Course Contents:

Unit 1: Introduction of Biomedical Instrumentation Medicine and Medical Devices a review, Generalized block diagram of the medical instrumentation system, Classification of Biomedical Instruments. Interference in the measurements and modifying inputs, Compensation techniques.	[6]
Unit 2: Bio-Potentials Human body and Cell structure, Electrical Activity of Excitable Cells, The action and Resting potentials. Introduction of Bio-potentials related to the human body. ECG, EMG, EEG, ERG etc.	[6]
Unit 3: Bioelectrodes -Sensors-Transducers Introduction of resistive, capacitive and inductive sensors, Piezoelectric sensor, displacement and temperature measurement, optical and radiation sensors-transducers, Introduction and Classifications of the Bio-electrodes.	[6]
Unit 4: Cardiovascular system and measurements The anatomy of human heart. Electrocardiogram generation and measurements, The ECG Instrumentation lead techniques and signal conditioning, Measurement of Blood pressure, blood flow, blood volume and heart sound, Special techniques of ECG measurement. Introduction of ECG Bio-signal Processing and Signal Conditioning.	[6]
Unit 5: Biomedical measurements and Equipment's Digital revolution in the biomedical equipment's, EEG and its measurements. 10-20 measurements. Heart Rate and Pace-Makers, Defibrillators, Imaging techniques and its fundamentals, X-Ray, MRI, CT-Scan, Radiography, PET Scan, Ultra sonography, laser and robotics surgery equipment's, Equipment's in ICU and Patient monitoring systems.	[6]
Unit6: Electrical Hazards and Patient safety	[6]





Physiological effect of the electrical current on human, Significance of electrical danger, Micro and Macro shocks, Ground shocks, Hazards and methods of Accident prevention.

Text Books:

1. Jochen Schiller, Mobile Communications, Pearson, 2008.
2. Andreas F Molish, Wireless Communications, 2nd Edition, Wiley India Publications, 2013.
3. Wireless Communication, Theodore S. Rappaport, Prentice hall.

Reference Books:

1. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", PHI Private Limited, 2nd Edition, 2012.
2. John G. Webster, "Medical Instrumentation Application and Design", WSE Wiley India Private Limited, 3rd Edition, 2012.
3. Joseph J. Carr, John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 4th Edition, 2012.
4. R S. Khandpur, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, 2nd Edition, 2002.
5. Rangaraj M Rangayyan, "Biomeidcal Signal Analysis: A Case-Study Approach", Wiley India, 2011.




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Multidisciplinary Minor-IV

23ECMDB4	MDM	Data Visualization	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3Hrs/week	CA-1 :10 Marks CA 2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Programmable Logic Controller

Course Outcomes: At the end of the course, students will be able to:

CO1	Define key terms and concepts related to data visualization, including various types of visualizations and their purposes.
CO2	Explain the principles of effective visualization design, including color theory, typography, and the importance of clarity and accuracy in visual representations.
CO3	Demonstrate the ability to clean and prepare datasets for visualization, applying appropriate data transformation techniques to ensure data integrity and usability.
CO4	Analyze different data visualization tools and technologies, evaluating their strengths and weaknesses to specific data types and visualization objectives.
CO5	Explain the effectiveness of visualizations through user testing and feedback, providing constructive critiques based on established design principles and ethical considerations.
CO6	Explain an interactive data visualization.

Course Contents:

Unit 1: Introduction to Data Visualization Definition and importance of data visualization, History and evolution of data visualization, Overview of the data visualization process, Types of data visualizations (charts, graphs, maps, etc.)	[6]
Unit 2: Principles of Effective Visualization Principles of visual perception and cognition, designing for clarity and accuracy, Choosing the right chart types for data representation, Principles of colour theory and typography in visualization	[6]
Unit 3: Data Preparation and Cleaning Understanding data types and structures, Data cleaning methods (handling missing values, outliers, etc.), Data transformation for visualization, Best practices for working with datasets	[6]
Unit 4: Tools and Technologies for Data Visualization Overview of data visualization tools (Tableau, Power BI, D3.js, etc.), Introduction to programming languages for visualization (Python, R), Creating interactive visualizations, Integrating visualizations into web applications	[6]
Unit 5: Advanced Visualization Techniques	[6]





Multidimensional data visualization techniques (scatter plots, parallel coordinates), Geographic and geospatial visualization, Temporal data visualization (time series, animations), Data storytelling and visualization narratives	
Unit 6: Evaluation and Best Practices Evaluating the effectiveness of visualizations, User testing and feedback, Ethical considerations in data visualization, Future trends and the role of AI/machine learning in visualization.	[6]
Text Books: 1. Jochen Schiller, Mobile Communications, Pearson, 2008. 2. Andreas F Molish , Wireless Communications, 2nd Edition , Wiley India Publications,2013. 3. Wireless Communication, Theodore S. Rappaport, Prentice hall.	
Reference Books: 1. "The Visual Display of Quantitative Information" by Edward R. Tufte 2. "Data Visualization: A Practical Introduction" by Kieran Healy 3. "Information Visualization: Perception for Design" by Colin Ware 4. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte 5. Data Wrangling with pandas" by Jacqueline Kazil and Katharine Jarmul 6. "Practical Statistics for Data Scientists" by Peter Bruce and Andrew Bruce 7. "Interactive Data Visualization for the Web" by Scott Murray 8. "Fundamentals of Data Visualization" by Claus Wilke 9. "Storytelling with Data: A Data Visualization Guide for Business Professionals" by Cole Nussbaumer Knaflic. 10. "Visualizing Data" by Ben Fry 11. "The Big Book of Dashboards: Visualizing Your Data Using Real-World Business Scenarios" by Steve Wexler, Jeffrey Shaffer, and Andy Cotgrave 12. "Data Visualization Handbook" by D. W. Hargreaves	





Multidisciplinary Minor-IV

23ECMDC4	MDM	SCADA system for Automation	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3Hrs/week	CA-1 :10 Marks CA 2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Programmable Logic Controller

Course Outcomes: At the end of the course, students will be able to:

CO1	Illustrate the Components and architecture of SCADA system.
CO2	Explain the SCADA communication architecture and protocols.
CO3	Make use of the SCADA software.
CO4	Analyze different applications of SCADA in industrial automation along with security.

Course Contents:

Unit 1: Introduction to SCADA Systems Overview of Industrial Automation and Control, Evolution of SCADA Systems, Components of SCADA: RTU, PLC, HMI, Sensors, Actuators, SCADA vs PLC.	[6]
Unit 2: SCADA Architecture and Components Centralized and Distributed Architectures, Master Terminal Unit (MTU) and Remote Terminal Unit (RTU), Human-Machine Interface (HMI), Data Acquisition and Processing.	[6]
Unit 3: Communication in SCADA Systems SCADA Communication Architectures, Communication Protocols: Modbus (RTU/TCP), DNP3, IEC 60870-5-101/104, OPC (OLE for Process Control), Wireless SCADA: IoT, 5G, and Edge Computing Integration.	[6]
Unit 4: SCADA Software and Programming Introduction to SCADA Software (e.g., Wonderware, Ignition, WinCC, Citect), SCADA System Configuration, Creating and Managing HMI Screens, Alarm Management and Event Logging, Data Logging and Reporting.	[6]
Unit 5: SCADA in Industrial Automation Applications in Power Systems, Water Treatment, Oil & Gas, Manufacturing, Integration of SCADA with PLCs and DCS, Real-time Monitoring and Control.	[6]
Unit 6: SCADA Security and Cybersecurity Issues SCADA Vulnerabilities and Threats, Cybersecurity Strategies for SCADA Systems, Firewall and VPN Implementation, Industrial Network Security Standards (IEC 62443).	[6]
Text Books: 1. Stuart A. Boyer, SCADA: Supervisory Control and Data Acquisition, ISA, 2015.	
Reference Books: 1. Frank Lamb, Industrial Automation: Hands-On, McGraw-Hill, 2013.	



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Aptitude Skills- IV
(Numerical Ability)

23HSSM07	VEC	Aptitude Skills- IV	1-0-0	Audit
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Teaching Scheme:	Evaluation Scheme:
Lecture: 1Hrs/week	CA-1 :25 Marks
	CA 2 :25 Marks

Pre-Requisites: - Aptitude Skills-I, II & III

Course Outcomes: At the end of the course, students will be able to:

CO1	Solve the questions on ordering of words & Parts of Speech
CO2	Organize contents of Business Communications such as CV, emails and letters.
CO3	Solve the questions based on jumbled paragraphs and reading comprehension.
CO4	Solve the questions on spotting error and sentence correction.
CO5	Summarize proceedings of any event or conference.
CO6	Discuss about current and critical issues during group discussion.

Course Contents:

Unit 1: Parts of Speech, Punctuation Word Family (Using the same word as different Parts of Speech)	[2]
Unit 2: Analogy, Letter Writing (Formal), E-Mail Writing, CV Writing	[2]
Unit 3: Reading Comprehension, Paragraph Jumbles	[2]
Unit 4: Spotting Errors (in different parts of sentence), Subject-Verb Agreement Sentence Correction, Sentence Completion	[2]
Unit 5: One Word Substitution, Narrating Events/Reports, Summary/Precis Writing	[2]
Unit 6: Dialogue writing Group Discussion, Interview Skills (Using formal notations & gestures etc.)	[2]

Text Books:

1. Raymond Murphy, Essential English Grammar with Answers, Murphy
2. Objective General English by R.S. Aggarwal, S Chand Publishing; Revised edition (15 March 2017)

Reference:

1. Rao and D. V. Prasada, Wren & amp; Martin High School English Grammar and Composition Book, S Chand Publishing, 2017.
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press; Second edition.




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Language Skill- IV

23HSSM08	VEC	Language Skills- IV	0-0-2	Audit
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Teaching Scheme:	Evaluation Scheme:
Practical: 2Hrs/week	CA-1 :25 Marks CA -2 :25 Marks

Pre-Requisites: - Language Skills-I, II &III

Course Outcomes: At the end of the course, students will be able to:

CO1	Make use of Function in Python Programming.
CO2	Make use of Python collections.
CO3	Make use of classes and its objects in python.
CO4	Make use of file and it's handling functions.

Course Contents:

1. Write a Python program to define a user-defined function that takes a number as input and returns whether it is even or odd. Call the function and display the result. o Concepts: Function definition, arguments, return value.	[2]
2. Create a Python program to define and call a function with default arguments and keyword arguments. o Concepts: Function calling, argument types.	[2]
3. Write a Python program using a lambda function to compute the square, cube, and factorial of a given number. o Concepts: Lambda function basics	[2]
4. Write a Python program to demonstrate list operations such as creation, adding items, removing an item, slicing, and sorting. o Concepts: List constructor, change, remove, sort, list comprehension	[2]
5. Write a Python program to demonstrate the use of tuples and sets. Perform operations such as checking membership, adding/removing elements (set), and iterating. o Concepts: Tuple immutability, set operations.	[2]
6. Write a Python program to create a dictionary of employees with their ID as key and name as value. Perform operations like adding a new entry, updating existing, and deleting one. o Concepts: Dictionary operations, loop through dictionary.	[2]
7. Write a Python program to create a class Student with attributes name, roll_no, and a method display(). Create an object and access its members. o Concepts: Class, object, method access.	[2]
8. Create a class with an __init__() constructor to initialize data members and a destructor to display a message when the object is deleted. o Concepts: Constructor, destructor.	[2]
9. Write a program to demonstrate single inheritance where a class Vehicle is inherited by a class Car. Use super() to access base class methods.	[2]





○ Concepts: Inheritance, super().	
10. Write a Python program to open a text file in write mode and write your personal information (name, age, department). Then, read and display the content of the file. ○ Concepts: File open, write, read, file modes.	[2]
11. Write a program to read a file line by line using readline() and count the number of characters in each line. ○ Concepts: File reading, character offset.	[2]
12. Create a program to open a file in append mode and add new content. Use exception handling to manage file not found or access errors. ○ Concepts: File handling with exception management.	[2]
Text Books: 1. Python Projects (Author: Laura Cassell, Alan Gauld) Wrox publication 2. Murach's Python Programming. Author: Michael Urban, Joel Murach, Murach's Publication.	
Reference Books: 1. Fundamentals of Python (First Program) Cengage MINDTAP Publication 2nd Edition. Author: K.A. Kambert	

