

**K.T.S.P. MANDAL'S**  
**HUTATMA RAJGURU MAHAVIDYALAYA**

RAJGURUNAGAR, TAL-KHED, DIST-PUNE 410505

**Department of Computer Science**

Academic Year 2022-2023

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### **Program Specific Outcome**

- PSO 1: Ability to apply knowledge of computing, mathematics, and basic sciences that may Be relevant and appropriate to the domain.
- PSO 2: Ability to analyze a problem, identify and define the computing requirements, which may be appropriate to its solution.
- PSO 3: Ability to design, implements, and evaluate computer-based system, process, component, or program to meet desired needs and to solve computational problem.
- PSO 4: An ability to function effectively on teams to accomplish a common goal.
- PSO 5: Understanding of professional, ethical, legal, security, social issues and responsibilities.
- PSO 6: Demonstrate understanding of the principles and working of the hardware and Software aspects of computer systems.
- PSO 7: Ability to analyze the local and global impact of computing on individuals, organizations, and society.
- PSO8: To enhance skills and adapt new computing technologies for attaining professional Excellence and carrying research.
- PSO 9: Ability to use current techniques, skills, and tools necessary for computing practices.
- PSO 10: Ability to use and apply current technical concepts and practices in the core development of solutions in the form of Information technology.

### **Course Outcome:**

Class	Semester	Paper (Paper no. & Code)	Subject	Course Outcome
F.Y.B.Sc. (Comp. Sci)	I	Computer Science Paper-I (CS-111)	Problem Solving Using Computer And C Programming-I	CO 1: Draw the flowchart and design an algorithm for a given problem by using operators.

				<p>CO 2: Develop conditional and iterative statement to write C programs.</p> <p>CO 3: Understand user defined function to solved real time problems.</p> <p>CO 4: C Programs that use pointers to access arrays.</p> <p>CO 5: String Manipulation and functions.</p> <p>CO 6: Understand user defined data types including structures and union to solve problems.</p>
	I	Computer Science Paper-II (CS-112)	Database Management System	<p>CO 1: Understand terms related to database design and management.</p> <p>CO 2: Understand the objective of the data and information management.</p> <p>CO 3: Understand the database development process.</p> <p>CO 4: To understand the relational model &amp;relational database management system.</p> <p>CO 5: Asses data and information requirements.</p> <p>CO 6: Conceptual data models.</p>
	I	Computer Science Paper-III (CS-113)	Practical based on CS-111 and CS-112	<p>CO 1: Apply the specification of syntax rules for numerical constants and variables, data types.</p> <p>CO 2: To use Arithmetic, Conditional, Logical and Relational operators and other C construct.</p> <p>CO 3: Write a c program using decision making, branching, looping construct.</p> <p>CO 4: Apply and write C Program to implement 1-D and 2-D arrays.</p> <p>CO 5: Write programs using functions.</p> <p>CO 6: Apply basic concept of database system and application.</p> <p>CO 7: Use the basic of SQL</p>

				and construct queries using SQL in database creation and interaction.
	I	Electronic Science Paper-I (ELC-111)	Semiconductor Devices and Basic Electronic Systems	CO 1: To analyze basic PN junctions in semi-conductor devices under various conditions CO 2: To design and analyze simple rectifiers and voltage regulators using diodes. CO 3: To describe the behavior of special purpose diodes. CO 4: Do design and analyze simple BJT and MOSFET circuits.
	I	Electronic Science Paper-II (ELC-112)	Principles of Digital Electronics	CO 1: Convert different type of codes and number systems which are used in digital Communication and computer systems. CO 2: The ability to understand, analyze and design various combinational circuits CO 3: To compare different types of logic families which are the basic unit of different types of logic gates on the basis of cost, capacity, performance and efficiency. CO 4: Design various logic gates and simplify Boolean equations. CO 5: Illustrate reduction of logical expressions using Boolean algebra and k-map method.
	I	Electronic Science Paper-I (ELC-113)	Electronics Practical (Lab-IA)	CO 1: Distinguish between analog and digital systems. CO 2: Identify the various digital ICs and understand their operation CO 3: Apply Boolean laws and K-map to simplify the digital circuits CO 4: Ability to identify basic requirements for a design application and propose a cost effective

				<p>solution.</p> <p>CO 5: The ability to identify and prevent various hazards and timing problems in a digital design.</p> <p>CO 6: To develop skill to build, and troubleshoot digital circuits.</p> <p>CO 7: Acquire a basic knowledge in solid state electronics including diodes, MOSFET, BJT, and Operational amplifier.</p>
	I	Mathematics Paper-I- (MTC-111)	Matrix algebra	<p>CO1: perform matrix operations</p> <p>CO 2: find the inverse of a matrix</p> <p>CO 3: Obtain row reduction and echelon forms, vector equations</p> <p>CO 4: obtain solution set of linear system</p> <p>CO 5: find partitioned matrices, LU decomposition</p>
	I	Mathematics Paper-II - (MTC-112)	Discrete Mathematics	<p>CO1: Know the Propositional Logic, Logical Connectives, proportional Equivalence.</p> <p>CO 2: Identify Universal Quantifier, Existential Quantifier.</p> <p>CO 3: Know the Rules of Inference.</p> <p>CO 4: Types of Relations, Representation of Relations</p> <p>CO 5: Draw Hasse diagram.</p>
	I	Mathematics Paper-III - (MTC-113)	Mathematics Practical	<p>CO 1: Show equivalence by using maxima software</p> <p>CO 2: Find adjacency and incidence matrix by using maxima software.</p> <p>CO 3: Find Conjunctive Normal Form and Disjunctive Normal Form by using maxima software.</p> <p>CO 4: Simplify the boolean expressions by using maxima.</p> <p>CO5: By using maxima software determines permutation and combination.</p>
	I	Statistics Paper I-	Descriptive	CO 1: Acquire basic concepts

		(CSST- 111)	Statistics	of Statistics CO 2: Compute various measures of central tendency CO 3: Identify the nature of data using moments, skewness and kurtosis measure CO 4: Analyze data pertaining to attributes and interpret the results.
	I	Statistics Paper II- (CSST- 112)	Mathematical Statistics	CO 1: Understand basic concepts of probability CO 2: Understand concept of conditional probability CO 3: Compute probabilities of various events CO4: Understand applications of standard discrete distributions
	I	Statistics Paper III- (CSST- 113)	Statistics Practical	CO 1: Tabulate and make frequency distribution of the given data. CO 2: Use various graphical and diagrammatic techniques and interpret. CO 3: Compute various measures of central tendency, dispersion, Skewness and kurtosis. CO 4: Fitting of Binomial and Poisson distributions.
F.Y.B.Sc. (Comp. Sci)	II	Computer Science Paper-I (CS-121)	Advanced C	CO 1: Develop modular programs using control structures, pointers, strings and structures CO 2: Design and develop solutions to real world problems using advanced C. CO 3: Understand user defined data types including structures and union to solve problems. CO 4: Implement C Programs using pointers and to allocate memory using dynamic memory management functions. CO 5: Exercise files concepts to show input and output of files in C.

	II	Computer Science Paper-II (CS-122)	Relational Database Management System	<p>CO1- Design E-R model for given requirements and convert the same into database tables.</p> <p>CO2- Use database techniques such as SQL and PL/SQL.</p> <p>CO3- Explain transaction management in relational database system.</p> <p>CO4-Use advanced database programming concepts.</p>
	II	Computer Science Paper-III (CS-123)	Practical based on CS-121 and CS-122	<p>CO 1: Develop program using strings.</p> <p>CO 2: Enabling effective usage of pointers and structures.</p> <p>CO 3: Develop a program using enumerated data type, functions, union and nested structures.</p> <p>CO 4: Implementing the files and command line arguments.</p> <p>CO 5: Designing the basic concept of database.</p> <p>CO 6: Implementing data integrity constraints in database.</p> <p>CO 7: Validating the various fundamental tasks to perform data modeling.</p>
	II	Electronic Science Paper-I (ELC-121)	Instrumentation Systems	<p>CO 1: Working principle of resistive, inductive and capacitive transducers and their applications.</p> <p>CO 2: Understanding of thermo-couples piezoelectric and pyro-electric transducers and their applications.</p> <p>CO 3: Understanding of optical sensors and other sensors.</p> <p>CO 4: Understand Various physical parameters of sensors using industry and normal measurement applications.</p> <p>CO 5: Understand and analyze the IC741 operational amplifier and its</p>

				<p>characteristics.</p> <p>CO 6: Design the solution for linear and non-linear applications using IC741.</p>
	II	Electronic Science Paper-II (ELC-122)	Basics of Computer Organization	<p>CO 1: Understand the theory and architecture with functionality of central processing unit.</p> <p>CO 2: Analyze sum of the design issues in terms of speed, technology, cost and performance.</p> <p>CO 3: Analyze the performance of various classes of memories, build large memories using small memories for better performance.</p> <p>CO 4: Implement and verify the truth tables of various flip-flops.</p> <p>CO 5: Design and implement the counters</p> <p>CO 6: Design and implement the sequential circuits such as registers and sequence generators.</p> <p>CO 7: Design and analyze Synchronous and Asynchronous sequential circuits using flip-flop.</p> <p>CO8: Identify the basic forms of data movement in shift registers.</p>
	II	Electronic Science Paper-I (ELC-123)	Electronics Practical (Lab-IB)	<p>CO 1: Design and Construct flip-flops, counters and shift registers.</p> <p>CO 2: Simulate synchronous and asynchronous up down counters.</p> <p>CO 3: Use of OPAMP as comparator and its use in DC motor driving.</p> <p>CO 4: Use of OPAMP as comparator and its use in DC motor driving.</p> <p>CO 5: Build and test Inverting and non -inverting amplifier using OPAMP.</p>

				CO6-Build and test adder and subtractor circuits using OPAMP.
	II	Mathematics Paper-I- (MTC-121)	Linear Algebra	CO 1: understand vector spaces and subspaces. CO2: Find Null spaces, column spaces. CO 3: Find Linearly independent sets and basis for vector spaces. CO4: Obtain eigenvalues and eigenvectors, characteristic equation. CO5: perform diagonalization of matrices, linear transformations.
	II	Mathematics Paper-II - (MTC-122)	Graph Theory	CO1: Understand basic terminologies and results of Graphs, Graphs models. CO 2: Know the types of Graphs, Types of the Diagraphs, Isomorphism of the Graphs CO 3: Calculate Adjacency and Incidence Matrix of a Graph. CO 4: Find Sub-graphs, induced sub-graphs of graph. CO 5: Know the Elementary properties of the Connectedness. CO 6: Perform vertex deletion and edge deletion operation on graph. Counting paths between vertices.
	II	Mathematics Paper-III - (MTC-123)	Mathematics Practical	CO 1: Find the Matrix representation and elementary result, isomorphism of graphs, application of special types of graphs. CO 2: Shortest path problems, Dijkstra's algorithm CO 3: Find Eulerian path, Hamiltonian path, Travelling salesman problem, Chinese Postman Problem.
	II	Statistics Paper I- (CSST- 121)	Methods of applied Statistics	CO 1: Understand the concept of bivariate data CO 2: Compute and interpret



				<p>Correlation coefficient</p> <p>CO 3: Understand the concept of Regression analysis</p> <p>CO 4: Understand the concept of multiple regression, multiple and partial correlation.</p>
	II	Statistics Paper II- (CSST- 122)	Continuous probability distributions and testing of hypothesis	<p>CO 1: Understand the concept of standard continuous probability distribution</p> <p>CO 2: Identify the situations where Uniform, Exponential and Parato and Normal distribution can be used</p> <p>CO 3: Compute probabilities corresponding to Uniform, Exponential and Parato and Normal distribution</p>
	II	Statistics Paper III- (CSST- 123)	Statistics Practical	<p>CO 1: Understand the relationship between two variables using scatter plot.</p> <p>CO 2: Compute coefficient of correlation, coefficient of regression.</p> <p>CO 3: fitting of various regression models and to find best fit.</p> <p>CO 4: fitting of Normal distribution.</p>
S.Y.B.Sc. (Comp. Sci)	I	Computer Science Paper-I (CS-231)	Data Structures and Algorithms-I	<p>CO 1: To use well-organized data structures in solving various problems.</p> <p>CO 2: To differentiate the usage of various structures in problem solution</p> <p>CO 3: Implementing algorithms to solve problems using appropriate data structures.</p>
	I	Computer Science Paper-II (CS-232)	Software Engineering	<p>CO 1: Compare and chose a process model for a software project development.</p> <p>CO 2: Identify requirements analyze and prepare models.</p> <p>CO 3: Prepare the SRS, Design document, Project plan of a given software system.</p>

	I	Computer Science Paper-III (CS-233)	Practical course on CS 231 (Data Structures and Algorithms I) and CS 232 (Software Engineering)	CO 1: Select appropriate data structures as applied to specified problem definition. Implement operations. CO 2: like searching, insertion, and deletion, traversing mechanism etc. on various linear data structures. CO 3: Students will be able to implement Linear structures. CO 4: Implement appropriate sorting/searching technique for given problem CO 5: Determine and analyze the complexity of given Algorithms.
	I	Electronic Science Paper-I (ELC-231)	Microcontroller architecture & Programming	CO 1: To write programs for 8051 microcontrollers CO 2: To interface I/O peripherals to 8051 microcontrollers CO 3: To design small microcontroller-based projects
	I	Electronic Science Paper-II (ELC-232)	Digital communication & Networking	CO 1: Define and explain terminologies of data communication CO 2: Understand the impact and limitations of various digital modulation techniques CO 3: communication to acknowledge the need of spread spectrum schemes. CO 4: Identify functions of data link layer and network layer while accessing communication link CO 5: To choose appropriate and advanced techniques to build the computer network
	I	Electronic Science Paper-III (ELC-231)	Practical Course	CO 1: To design and build his/her own microcontroller-based projects. CO 2: To acquire skills of Embedded C programming CO 3: To know multiplexing and modulation techniques useful in developing wireless Application CO 4: Do build and test own

				network and do settings.
S.Y.B.Sc. (Comp. Sci)	II	Computer Science Paper-I (CS-241)	Data Structures and Algorithms-II	CO 1: Implementation of different data structures efficiently CO 2: Usage of well- organized data structures to handle large amount of data CO 3: Usage of appropriate data structures for problem solving
	II	Computer Science Paper-II (CS-242)	Computer Networks-I	CO 1: Have a good understanding of the OSI and TCP/IP Reference Models and in particular have a good knowledge of Layers. CO2: Understand the working of various protocols. CO 3: Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
	II	Computer Science Paper-III (CS-243)	Practical course on CS 241 (Data Structures and Algorithms II) and CS 242 (Computer Networks-I)	CO 1: Implement operations like searching, insertion, and deletion, traversing mechanism etc. on trees data structures. CO 2: Students will be able to implement Non-Linear data structures. CO 3: Design advance data structure using Non-Linear data structure.
	II	Electronic Science Paper-I (ELC-241)	Embedded System Design	CO 1: To understand the difference between general computing and the embedded systems. CO 2: To know the fundamentals of embedded systems. CO 3: Understand the use of Single board Computer (Such as Raspberry Pi) for an embedded system application. CO 4: Familiar with the programming environment to develop embedded systems and their interfaces with peripheral devices.

				CO 5: To develop familiarity with tools used to develop in an embedded environment.
	II	Electronic Science Paper-II (ELC-242)	Wireless Communication and Internet of Things (IoT)	CO1: Know working of wireless technologies such as Mobile communication, GSM, GPRS. CO 2: Become familiar with 3G and 4G Cellular Network Technologies for Data Connections. CO3: Understand working principles of short-range communication application CO 4: Get introduce to upcoming technology of Internet of Things CO 5: Explore themselves and develop new IoT based applications
	II	Electronic Science Paper-III (ELC-241)	Practical Course	CO 1: To design and develop own smart applications using Raspberry-Pi. CO 2: To write Python program for simple applications. CO 3: To build own IoT based system.
T.Y.B.Sc. (Comp. Sci)	I	Computer science paper I(CS-351)	Operating Systems-I	CO 1: Processes and Thread Scheduling by operating system CO 2: Synchronization in process and threads by operating system. CO 3: Memory management by operating system using with the help of various schemes
	I	Computer science Paper II (CS 352)	Computer Networks – II	CO 1: Student will understand the different protocols of Application layer. CO 2: Develop understanding of technical aspect of Multimedia Systems CO 3: Develop various Multimedia Systems applicable in real time. CO 4: Identify information security goals

	I	Computer Science Paper VII (CS 357)	Practical course based on CS 351	CO 1: Process synchronization CO 2: Processes and Thread Scheduling by operating system CO 3: Memory management by operating system using with the help of various schemes
	I	Computer Science Paper III (CS 353)	Web Technologies -I	CO 1: Understand how to develop dynamic and interactive Web Page
	I	Computer Science Paper IV (CS 354)	Foundations of Data Science	CO 1: Perform Exploratory Data Analysis CO 2: Obtain, clean/process, and transform data. CO 3: Detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization. CO 4: Demonstrate proficiency with statistical analysis of data. CO 5: Present results using data visualization techniques.
	I	Computer Science Paper VIII (CS 358)	Practical course based on CS 353 and CS 354	CO 1: Understand how to develop dynamic and interactive Web Page CO 2: Prepare data for use with a variety of statistical methods and recognize how the quality of the data may affect conclusions. CO 3: Perform exploratory data analysis
	I	Computer Science Paper V (CS 355)	Object Oriented Programming using Java - I	CO 1: Understand the concept of classes, object, packages and Collections. CO 2: To develop GUI based application
	I	Computer Science Paper VI (CS 356)	Theoretical Computer Science	CO 1: Understand the use of automata during language design. CO 2: Relate various automata and Languages.
	I	Computer Science Paper VI (CS 359)	Practical Course based on CS 355	CO 1: Use an integrated development environment to

				<p>write, compile, run, and test simple object-oriented Java programs.</p> <p>CO 2: Read and make elementary modifications to Java programs that solve real-world problems.</p> <p>CO 3: Validate input in a Java program</p>
	I	Computer Science Paper X (CS 3510)	Python Programming	<p>CO 1: Develop logic for problem solving.</p> <p>CO 2: Determine the methods to create and develop Python programs by utilizing the data</p> <p>CO 3: structures like lists, dictionaries, tuples and sets.</p> <p>CO 4: To be familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc.</p> <p>CO 5: To write python programs and develop a small application project</p>
	I	Computer Science Paper XI (CS 3511)	Blockchain Technology	<p>CO 1: Learn the fundamentals of Blockchain Technology.</p> <p>CO 2: Learn Blockchain programming</p> <p>CO 3: Basic knowledge of Smart Contracts and how they function.</p>
T. Y. B. Sc. (Comp. Sci)	II	Computer Science Paper I (CS 361)	Operating Systems – II	<p>CO 1: Management of deadlocks and File System by operating system.</p> <p>CO 2: Scheduling storage or disk for processes.</p> <p>CO 3: Distributed Operating System and its architecture and the extended features in mobile OS.</p>
	II	Computer Science Paper II (CS 362)	Software Testing	<p>CO 1. To understands various software testing methods and strategies.</p> <p>CO 2. To understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software.</p> <p>CO 3. To design test cases and test plans, review reports of</p>

				testing for qualitative software. CO 4. To understand latest testing methods used in the software industries.
	II	Computer Science Paper VII (CS 367)	Practical course based on CS 361	CO 1: Management of deadlocks by operating system CO 2: File System management CO 3: Disk space management and scheduling for processes
	II	Computer Science Paper III (CS 363)	Web Technologies – II	CO 1: Build dynamic website. CO 2: Using MVC based framework easy to design and handling the errors in dynamic website.
	II	Computer Science Paper IV (CS 364)	Data Analytics	CO 1: Use appropriate models of analysis, assess the quality of input, and derive insight from results. CO 2: Analyze data, choose relevant models and algorithms for respective applications CO 3: Understand different data mining techniques like classification, prediction, clustering and association rule mining CO 4: Apply modeling and data analysis techniques to the solution of real-world business problem
	II	Computer Science Paper VIII (CS 368)	Practical course based on CS 363 and CS 364	CO 1: Build dynamic website. CO 2: Using MVC based framework easy to design and handling the errors in dynamic website.
	II	Computer Science Paper V (CS 365)	Object Oriented Programming using Java - II	CO 1: To access open database through Java programs using Java Data Base Connectivity (JDBC) and develop the application. CO 2: Understand and create dynamic web pages, using Servlets and JSP. CO 3: Work with basics of framework to develop secure web applications.
	II	Computer Science Paper VI (CS 366)	Compiler Construction	CO 1: Understand the process of scanning and parsing of source code. CO 2: Learn the conversion

				code written in source language to machine language. CO 3: Understand tools like LEX and YACC.
	II	Computer Science Paper IX (CS 369)	Practical Course based on CS 365	CO 1: To Learn database Programming using Java CO 2: Understand and create dynamic web pages using Servlets and JSP. CO 3: Work with basics of framework to develop secure web applications
	II	Computer Science Paper X (CS 3610)	Software Testing Tools	CO 1: To understand various software testing methods and strategies. CO 2: To understand a variety of software metrics and identify defects and managing those defects for improvement in quality for given software. CO 3: To design test cases and test plans, review reports of testing for qualitative software. CO 4: To understand latest testing tools used in the software industries.
	II	Computer Science Paper XI (CS 3611)	Project	CO 1: To understand how to do the project in IT Industry. CO 2: Using this small project student understand how to do. CO 3: Understand how to present project and how to design it.

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