

A.T.S.S.'s
College of Business Studies and Computer Applications

Chinchwad, Pune 19

(Affiliated to Savitribai Phule Pune University, Recognized by Govt. of Maharashtra , Accredited by NAAC)

Academic Year 2019 – 20

Program: BSc (Computer Science)

Department of Computer Science & Applications

Program Outcomes (PO)

PO1:Knowledge: Apply the knowledge of mathematics, Electronics and Computer science, to the solution of complex problems.

PO2: Problem analysis: Identify, formulate, and analyze most challenging computer science problems and reaching substantiated conclusions using principles of mathematics, and Computer sciences.

PO3: Design/development of solutions: Design and Develop solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal considerations.

PO4: Modern tool usage: Create, select, and apply appropriate techniques, resources and IT tools including prediction and modelling to complex activities with an understanding of the limitations.

PO5: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Computer Science.

PO6: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO7:Project management: Demonstrate knowledge and understanding of the management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO8:Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PEO – Program Educational Objectives:

1. To provide knowledge of technological and practical aspects of electronics.
2. To familiarize with current and recent technological developments
3. To enrich knowledge through activities such as industrial visits, seminars, projects etc.
4. To train students in skills related to computer industry and market.
5. To create foundation for research and development in Electronics/Computer.
6. To develop analytical abilities towards real world problems.
7. To help students to build-up a progressive and successful career.

F. Y. BSc.

Semester I

Course: Problem Solving using Computer and 'C' Programming (CS-111)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Problem Solving Aspects 'C' Fundamentals	Explain the algorithmic approaches to problem solving.
CO2	Control Structures	Develop programs using control structures.
CO3	Functions	Develop Modular programming.
CO4	Array	Develop modular programs using arrays in 'C'.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Problem Solving using Computer and 'C' and engage in a life-long learning.

Course: Database Management Systems (CS-112)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to DBMS	Explain the fundamental concepts of database and its structure.
CO2	Conceptual Design	Analyze DB design process and explain the various data models
CO3	SQL	Develop SQL queries and create relational database in PostgreSQL.
CO4	Relational Database Design	Design relational data structures of moderate complexity with concepts of decomposition and Normalization.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Database Management Systems and engage in a life-long learning.

Course: Semiconductor Devices and Basic Electronic Systems (ELC-111)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Semiconductor Diodes and Bipolar Junction Transistor (BJT)	Explain the basics of semiconductor devices and analyze different types of transistor circuits
CO2	MOSFET	Explain the concept of MOSFET
CO3	Power Supply and Oscillators	Design different types of power supply units, oscillators and multivibrator circuits
CO4	Data Converters	Explain the operation of data converter
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Semiconductor Devices and Basic Electronic Systems and engage in a life-long learning.

Course: Principles of Digital Electronics (ELC-112)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Number System and Digital Codes	Analyze the basics of number systems
CO2	Logic gates and Boolean Algebra	Design the logical circuit using logic gates and boolean expression.
CO3	Combinational Circuits	Design the combinational circuits.
CO4	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Principles of Digital Electronics and engage in a life-long learning.

Course: Matrix Algebra (MTC-111)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction	Explain the fundamentals of Matrix Algebra
CO2	Linear Equation in Linear Algebra-I	Analyze the Linear Equation and solve it in Maxima Software
CO3	Linear Equation in Linear Algebra-II	Explain the Partitioned Matrix, Matrix Factorization and solve problems to present solutions
CO4	Determinants	Explain the determinant measures geometrically and analyze the determinant problems.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Matrix Algebra and engage in a life-long learning.

Course: Discrete Mathematics (MTC-112)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Logic	Analyze basic logic statements including and construct simple mathematical proofs
CO2	Lattices and Boolean Algebra	Explain basic mathematical objects, simple mathematical properties and solve problems in maxima
CO3	Counting principle	Analyze the problems in maxima, combinatorial problems by applying basic counting techniques and explain various techniques of mathematical permutation and combination
CO4	Recurrence relation	Explain the computer programs in a formal mathematical manner and solve problems using recurrence relations to implement recurrence relation in maxima.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Discrete Mathematics and engage in a life-

		long learning.
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Course: Descriptive Statistics – 1(CSST-111)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Data Condensation and Presentation of Data	Explains fundamentals of Statistics and methods of data collection by interpreting diagrams and graphs
CO2	Descriptive Statistics	Explains and evaluates various measures of central tendency and dispersion-Range, Quartile deviation, Mean deviation, Standard deviation.
CO3	Moments, Skewness and Kurtosis	Explain the concept of moments, skewness and kurtosis of distributions and solve problems.
CO4	Theory of Attributes	Explain the association of attributes and different methods of measures of association.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Descriptive Statistics – 1 and engage in a life-long learning.

Course: Mathematical Statistics (CSST- 112)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Theory of Probability	Explain the different approaches to probability and evaluates probability of events
CO2	Conditional Probability and Independence	Explains the meaning & concept of conditional probability and analyzes application level problems.
CO3	Random Variable	Analyze the random variable and a probability distribution.
CO4	Standard Discrete Distributions	Explain the role of the standard normal distribution by solving probabilities using various methods.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Mathematical Statistics and engage in a life-long learning.

Semester II

Course: Advanced ‘C’ Programming (CS-121)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Pointers, Strings	Develop the programs based on pointers and string and explain the dynamic memory management concept.

CO2	Structures And Unions	Develop the programs based on Structures and Unions
CO3	File Handling	Explain the files and their operations and develop the related programs
CO4	Preprocessor	Explain the concept of header files.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Advanced 'C' Programming and engage in a life-long learning.

Course: Relational Database Management Systems (CS-122)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Relational Database Design Using PLSQL	Analyze and design a real database application using PLSQL.
CO2	Transaction Concepts and concurrency control	Explain the properties of transaction mgmt.
CO3	Database Integrity and Security Concepts	Explain the database security concepts and database integrity
CO4	Crash Recovery	Explain the recovery management in DBMS
CO5	Other Databases	Explain the latest trend in DB world, parallel and distributed Databases.
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Relational Database Management Systems and engage in a life-long learning.

Course: Instrumentation System (ELC-121)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Instrumentation System	Explain the concept of instrumentation system and specifications of sensor
CO2	Sensors and Actuators	Explain the different types of sensors and actuators and application of it.
CO3	Smart Instrumentation System and Smart Sensor	Explain the smart instrumentation system and smart sensors
CO4	Op-Amp as Signal Conditioner	Design and implementation of op-amp and its circuits
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Instrumentation System and engage in a life-long learning.

Course: Basics of Computer Organization (ELC- 122)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Flip flops	Design and implementation of flip flops

CO2	Shift Registers and Counters	Design and implementation sequential circuits
CO3	Basics of computer system	Explain the basics of computer system
CO4	Memory Organization	Explain the concept of memory organization
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Basics of Computer Organization and engage in a life-long learning.

Course: Linear Algebra (MTC-121)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	General Vector Spaces	Analyze the linear equations, matrix algebra and vector spaces by applying computational techniques and algebraic skills
CO2	Eigenvalues and Eigenvectors	Analyze the eigenvalues and eigenvectors by applying computational techniques and algebraic skills
CO3	Orthogonality and Symmetric Matrices	Explain the orthogonal projections, symmetric matrices and analyze orthogonality of vectors.
CO4	The Geometry of Vector Spaces	Explain the Affine Combinations, Affine Independence & Convex combinations with Geometric visualization.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Linear Algebra and engage in a life-long learning.

Course: Graph Theory (MTC- 112)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	An introduction to graph	Analyze the problems related networks and graphs
CO2	Connected graph	Explain the theory of paths and the degree of connectedness of a graph and prove central theorems about connectivity.
CO3	Euler and Hamilton graph	Analyze the graph theoretical problems by applying the algorithms
CO4	Trees	Analyze the central theorems about trees.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Graph Theory and engage in a life-long learning.

Course: Methods of Applied Statistics (CSST-121)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Correlation	Analyze the correlation between two variables and explain the significance.

CO2	Regression	Analyze the linear regression equation and explain the concept of regression analysis.
CO3	Multiple Regression and Multiple, partial Correlation	Analyze the Multiple and partial correlation between two variables explain its significance
CO4	Time series	Explain the concepts of time series and their application
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Methods of Applied Statistics and engage in a life-long learning.

Course: Continuous Probability Distributions and Testing of Hypothesis (CSST-122)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Standard Continuous Probability Distributions	Analyze the problems related standard continuous probability distribution.
CO2	Concepts and definitions related to testing of hypothesis	Explain the fundamentals of hypothesis and hypothesis testing.
CO3	Parametric Tests	Explain the appropriate statistical methods for data analyzing by applying parametric tests.
CO4	Simulation	Explain the different types of simulation which is applied in engineering disciplines.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Methods of Applied Statistics and engage in a life-long learning.

S. Y. BSc.

Semester III

Course: Data Structures and Algorithms – I (CS- 231)

	Course unit Description	Outcome
CO1	Introduction to Data Structures and Algorithm Analysis	Explain the need and types of data structure and analyze algorithms and its correctness.
CO2	Arrays	Explain the concept of static allocation and Develop the different searching and sorting techniques using Arrays.
CO3	Linked List	Explain the concept of dynamic allocation and Develop the linked list data structures and solution for specific problems.
CO4	Stack	Develop the stack data structures and solution for specific problems.
CO5	Queue	Develop the Queues data structures and solution for specific problems.
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Data Structure using 'C' and engage in a life-long learning.

Course: Software Engineering (CS-232)

	Course unit Description	Outcome
CO1	Introduction To Software Engineering and Process Models	Analyzes and design the complex systems by applying software engineering principles and techniques.
CO2	Agile Development	Explain the software process models such as the waterfall, evolutionary models, Incremental Process Models and Agile Process Models
CO3	Requirements Analysis	Explain the requirements engineering tasks and requirements engineering process
CO4	Requirements Modeling	Explain the concepts of Modeling and UML in which different diagrams like use case, class etc.
CO5	Design Concepts	Designing and implement data flow analysis and diagram and data dictionary.
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Software Engineering and engage in a life-long learning.

Course: Microcontroller Architecture & Programming (ELC-231)

	Course unit Description	Outcome
CO1	Basics of Microcontroller & Intel 8051 architecture	Explain the basics of Microcontroller and its architecture.
CO2	Programming model of 8051	Develop the different programming models using embedded C
CO3	Timer /Counter, Interrupts	Develop the programming models using embedded C for various peripherals.
CO4	Interfacing, Serial Communication	Explain the interfacing ADC, DAC etc, and implement different microcontroller applications using embedded C
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of The 8051 Architecture, Interfacing & Programming and engage in a life-long learning.

Course: Digital Communication and Networking (ELC-232)

	Course unit Description	Outcome
CO1	Introduction to Electronic Communication	Explain the basic communication system and Design of Hamming code
CO2	Modulation and Demodulation	Design and implementation of different modulation and demodulation circuits. Understand the impact and limitations of various digital modulation techniques
CO3	Multiplexing, Spectrum Spreading and Media Access Control	Explain the concept of digital communication techniques. To acknowledge the need of spread spectrum schemes.

CO4	Computer Networking	Identify functions of data link layer and network layer while accessing communication link To choose appropriate and advanced techniques to build the computer network
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Communication Principles and engage in a life-long learning.

Course: Groups and Coding Theory (MTC-231)

	Course unit Description	Outcome
CO1	Integers	Explain Division Algorithm, Euclid lemma, Equivalence relation.
CO2	Groups	Analyze the binary operations and the dimension of a groups.
CO3	Finite Groups and Subgroups	Explain order of groups, subgroups, finite subgroups, permutation groups
CO4	Groups and Coding Theory	Explain Coding of Binary Information and Error detection Decoding and Error Correction Introduction to Public Key Cryptography
CO5	Practical and Oral	Students are able to apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

Course: Numerical Analysis (MT-232)

	Course unit Description	Outcome
CO1	Algebraic and Transcendental Equation	Explain the numerical methods to obtain approximate solutions to mathematical problems.
CO2	Calculus of Finite Differences and Interpolation	Analyze the common numerical methods to obtain approximate solutions for intractable mathematical problems
CO3	Numerical Integration	Analyze the numerical methods for various mathematical operations and tasks and implement numerical methods.
CO4	Numerical Solution of Ordinary Differential Equation	Analyze numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration and implement numerical methods.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Numerical Analysis and engage in a life-long learning.

Course: Technical English (EN 231)

At the end of the course following outcome is expected:

	COURSE UNIT DESCRIPTION	OUTCOME
CO1	Literature Components	Explain the texts with attention to ambiguity, complexity, and aesthetic value and develop new strategies to enhance reading comprehension.
CO2	Vocabulary	Develop the communication skills by enhancing new vocabulary.
CO3	Grammar	Explain the grammar terminology.
CO5	Oral	Improve written, oral, and presentation communication skills related to the subject of Technical English and engage in a life-long learning.

Semester IV**Course: Data Structures and Algorithms-II (CS-241)**

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Tree	To efficiently implement tree data structures and solution for specific problems.
CO2	Efficient Search Trees	To efficiently understand Search Tree Algorithms and solution for specific problems.
CO3	Graph	To efficiently implement the graph data structures and solution for specific problems.
CO4	Hash Table	To efficiently implement the Hash Table data structures and solution for specific problems.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Data Structures and Algorithms and engage in a life-long learning.

Course: Computer Networks -I (CS-242)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Networks and Network Models	To understand the OSI and TCP/IP Reference Models, Layers and working of various protocols.
CO2	Lower Layers	To understand the lower layer model, protocols and interworking between computer networks with its application and implications.
CO3	Network Layer	Understand Network layer services and working process of IPv4 and IPv6
CO4	Transport Layer	Understand Transport layer services, working process of Connectionless and Connection-Oriented services.

CO5	Practical and Oral	Improve written, oral and presentation communication skills related to the subject of Computer Networks and engage in a life-long learning.
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Course: The 8051 Architecture, Interfacing & Programming (ELC-221)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Basics of Microcontroller & Intel 8051 architecture	Explain the basics of Microcontroller and its architecture.
CO2	Programming model of 8051	Develop the different programming models using embedded C
CO3	Timer / counter, serial communication, Interrupts & Programs using C language.	Develop the programming models using embedded C for various peripherals.
CO4	Interfacing, programming using C – language & applications of 8051	Explain the interfacing and implement different microcontroller applications using embedded C
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of The 8051 Architecture, Interfacing & Programming and engage in a life-long learning.

Course: Communication Principles (ELC-222)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Electronic Communication	Explain the basic communication system and Design of Hamming code
CO2	Modulation and Demodulation	Design and implementation of different modulation and demodulation circuits
CO3	Multiplexing and Multiple Access Techniques	Explain the concept of digital communication techniques.
CO4	Wireless Communication System	Explain the different advanced wireless systems and its application
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Communication Principles and engage in a life-long learning.

Course: Computational Geometry (MT-221)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Two Dimensional Transformation	Analyze the computational geometry in 2D transformation
CO2	Three Dimensional Transformation	Analyze the computational geometry in 3D transformation and explain Orthogonal projection, axonometric projection, oblique projection, perspective projection.
CO3	Plane Curves	Analyze various curves representation.
CO4	Space Curves	Analyze the Bezier Curves and strategies to

		model solve problems
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Computational Geometry and engage in a life-long learning.

Course: Operation Research (MTC 222)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Modelling with Linear Programming	Develop linear programming (LP) models and graphical representation of a two dimensional
CO2	The simplex method Duality	Analyze the simplex method to solve maximization LP problems and duality problems
CO3	Transportation Model and its variant	Explain the mathematical tools to solve optimization problems.
CO4		
CO5	Decision Analysis and Games	Analyze the zero-sum two- person games and explain the best strategy using decision making methods under uncertainty and game theory.
CO5	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Operation Research and engage in a life-long learning.

Course: Technical English (EN 221)

At the end of the course following outcome is expected:

	Course Unit Description	Outcome
CO1	Literature Components	Explain the working knowledge of poetry as a literary genres distinct literary characteristics of poetic forms.
CO2	Communication Skills	Develop the critical and innovative thinking by oral, written, and visual communication.
CO5	Oral	Improve written, oral, and presentation communication skills related to the subject of Technical English and engage in a life-long learning.

T. Y. BSc.

Semester V

Course: Operating System-I (CS - 351)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
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CO1	Introduction to Operating Systems	Identify the role of Operating System To understand the design of control unit
CO2	Processes and Threads	Identify the basic concept of Processes and states of processes Understanding concept of thread. Thread Scheduling by operating system
CO3	Process Scheduling	Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms.
CO4	Synchronization	Synchronization in process and threads by operating system and concept of Semaphore.
CO5	Memory Management	Memory management by operating system using with the help of various schemes
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Operating system- II and engage in a life-long learning.

Course: Computer Network-II (CS - 352)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Application Layer	To understand different protocols of application layer.
CO2	Multimedia	To understand concepts of multimedia.
CO3	Cryptography and Network Security	Explain the various types of Cryptography
CO4	Security in the Internet	Explain the structure and working of Security in the Internet and Network/INTERNET security.
CO5	Data Link Layer and Medium Access Sub layer	Explain the structure of Data Link Layer and their sub layers and solve problems related to

		Error detection and correction.
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Computer Network-II and engage in a life-long learning.

Course: Web Technologies - I(CS - 353)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to HTML, HTTP and PHP	Explain web techniques to develop dynamic web pages by using server side scripting language PHP.
CO2	Function and String	Understand how to develop a dynamic and interactive Web site
CO3	Arrays	Understand the use of programming constructs
CO4	Files and database handling	Understand how to handle different databases.
CO5	Handling email with php	Explain different advanced database techniques

Course: Foundation of Data Science (CS-354)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Data Science	Understand the process of Data Science., Obtain, clean/process, and transform data.
CO2	Statistical Data Analysis	Detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization. Demonstrate proficiency with statistical analysis of data.
CO3	Data Preprocessing	Prepare data for use with a variety of statistical methods and models and recognize how the quality of the data and the means of data collection may affect conclusions.
CO4	Data Visualization	Present results using data visualization techniques.

Course:Object Oriented Programming using Java - I(CS-355)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	An Introduction to Java	1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods. 2. Be able to use the Java SDK environment to create, debug and run simple Java programs.
CO2	Objects and Classes	1. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries
CO3	Inheritance and Interface	1. Understand the

		inheritance and interface concept and learn how to apply them.
CO4	Exception and File Handling	1. Understand Exception and file handling. 2. Understand how to interact with file using java programs.
CO5	User Interface with AWT and Swing	1. Understand and learn AWT, Swing concepts and how to implement.

Course: Theoretical Computer Science (CS-356)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction	Explain the operations on languages and regular expression identifiers.
CO2	Finite Automata	Explain the finite state,DFA as a pattern recognizer, NFA to DFA method.
CO3	Regular Languages Context Free Grammar and Languages	Explain regular language and context free language
CO4	Push Down Automaton	Develop the PDA using empty state &final state method.
CO5	Turing Machine	Explain the Turing machine and classes of problems.

Course: Python programming(CS-3510)

At the end of the course following outcome is expected

	Course unit Description	Outcome
CO1	An Introduction to Python	To be familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc
CO2	Control Statements	To be familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc Develop logic for problem solving
CO3	Lists, functions, tuples and dictionaries, Sets	To be familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc
CO4	Modules,Working with files, Exception handling	To write python programs and develop a small application project

Course: (CS-3511) Blockchain Technology

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Blockchain	Understand what and why of blockchain technology.
CO2	How Blockchain Works?	Explore major components of blockchain.
CO3	Smart Contracts	Learn about Bitcoin, Cryptocurrency and Ethereum. To learn blockchain programming using Python, Flask Web Framework, and HTTP client Postman.

Course Title:(CS-357) Practical Course based on CS – 351**Course Outcomes:**

1. Process synchronization
2. Processes and Thread Scheduling by operating system
3. Memory management by operating system using with the help of various scheme

Course Title: (CS-358) Practical Course based on CS - 353 and CS – 354**Course Outcomes:**

1. Understand how to develop dynamic and interactive Web Page
2. Prepare data for use with a variety of statistical methods and recognize how the quality of the data may affect conclusions.
3. Perform exploratory data analysis

Course Title:(CS-359) Practical Course based on CS – 355**Course Outcomes:**

1. Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
2. Read and make elementary modifications to Java programs that solve real-world problems.
3. Validate input in a Java program.

Semester VI

Course: Operating System-II (CS - 361)

At the end of the course the following outcome is expected:

	Course unit Description	Outcome
CO1	Process Deadlocks	Explain the concept of deadlocks in real life. Understand the mutual exclusion, deadlock detection and agreement protocols.
CO2	File system Management	Explain the policies for file systems and types of File allocation
CO3	Disk scheduling	Understanding of Scheduling storage or disk for processes. To improve the performance of disk i/o by reducing average seek time compared to the existing disk scheduling algorithm.
CO4	Introduction to Distributed operating systems & Architecture	Distributed Operating System and its architecture and the extended features in distributed OS. Illustrate principles and importance of distributed operating system Gain knowledge of distributed operating system architecture
CO5	Mobile Operating Systems	Analyze the various device and resource management techniques for mobile operating system.

Course: Software Testing (CS- 362)

At the end of the course the following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Software Testing	Fundamentals of testing
CO2	Software Testing Strategies & Techniques	Types of testing in details
CO3	Levels of Testing	Able to test on GUI's and all real-time systems and levels of testing
CO4	Testing Web Applications	Types of testing in details. Testing of Web applications
CO5	Agile Testing	Able to do testing with Tools.

Course: Web Technologies – II (CS-363)

At the end of the course the following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Web Techniques	Learn -PHP, Server Side Scripting Language
CO2	XML	Learn XML and XML parsers.
CO3	Java Script and JQuery	Using MVC based framework easy to design and handling the errors in dynamic website.
CO4	AJAX	Learn AJAX to make our application more dynamic.

CO5	PHP framework CodeIgniter	Using MVC based framework easy to design and handling the errors in dynamic website.
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Course: Data Analytics (CS-364)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Data Analytics	Use appropriate models of analysis, assess the quality of input, and derive insight from results.
CO2	Machine Learning Overview	Analyze data, choose relevant models and algorithms for respective applications
CO3	Mining Frequent Patterns, Associations, and Correlations	Understand different data mining techniques like classification, prediction, clustering and association rule mining
CO4	Social Media and Text Analytics	Apply modeling and data analysis techniques to the solution of real world business problems

Course: Object Oriented Programming using Java-II(CS-365)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Collections	Understanding of concept of Collections
CO2	Multithreading	develop a game application using multithreading
CO3	Database Programming	To access open database through Java programs using Java Data Base Connectivity (JDBC) and develop the application.
CO4	Servlets and JSP	Understand and Create dynamic web pages, using Servlets and JSP.
CO5	Spring Framework	Work with basics of framework to develop secure web applications

Course: Compiler Construction (CS-366)

At the end of the course the following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction	Understand and design code generation and optimization techniques.
CO2	Lexical Analysis (Scanner)	Understand tools like LEX and YACC.
CO3	Syntax Analysis (Parser)	Understand the process of scanning and parsing of source code
CO4	Syntax Directed Definition	Learn the conversion code written in source language to machine language.
CO5	Code Generation and Optimization	Learn the conversion code written in source language to machine language.

Course: Software Testing Tools (CS- 362)

At the end of the course the following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Test case design	Identify errors, bugs in the given application Design entry and exit criteria for test case, design test cases in excel

CO2	Test cases for simple programs	Write simple programs make use of loops and control structures.
CO3	Test cases and Test plan	Write Test Plan for given application with resources required.
CO4	Defect Report	Defect Life Cycle Classification of Defect
CO5	Testing Tools	Automation Tools Types of Testing Tools

Course Title: (CS -367) Practical Course based on CS - 361

Course Outcomes: After completion of this course students will be able to understand the concept of

1. Management of deadlocks by operating system
2. File System management
3. Disk space management and scheduling for processes

Course Title :(CS-368) Practical Course based on CS - 363 and CS - 364

Course Outcomes:

1. Build dynamic website.
2. Using MVC based framework easy to design and handling the errors in dynamic website.

Course Title: (CS-369) Practical Course based on CS - 365

Course Outcomes:

1. To Learn database Programming using Java
2. Understand and Create dynamic web pages using Servlets and JSP.
3. Work with basics of framework to develop secure web applications