

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' (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 (CS112)

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 (CS121)**

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 (CSST121)**

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 (CSST122)**

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 analysing 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)**

	<b>Course unit Description</b>	<b>Outcome</b>
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)**

	<b>Course unit Description</b>	<b>Outcome</b>
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)**

	<b>Course unit Description</b>	<b>Outcome</b>
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:

	<b>COURSE UNIT DESCRIPTION</b>	<b>OUTCOME</b>
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-I (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 (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 I**

**Course: System Programming (CS-331)**

At the end of the course following outcome is expected:

	Course unit Description	Outcome
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CO1	Introduction : Assembler, Editors	Design structure of a simple editor and assembler through simulation.
CO2	Macros and Macro Processors	Understand Design the structure and working of macro processor through simulated program.
CO3	Compilers Design Process Linker and Loader Debugger & Development utilities	Explain the interpreter, compiler and working of linkers, loaders and development utilities
CO4	Operating system as system software	Analyze the efficiency of different memory management, file management, storage management and process management.
CO5	System Structure	Explain the structure of operating system.
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of System Programming and engage in a life-long learning.

### Course: Theoretical Computer Science (CS-332)

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, NFA with e
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.
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Theoretical Computer Science and engage in a life-long learning.

### Course: Computer Network-I (CS-333)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Computer Networks	Explain the basics of computer network and different topologies
CO2	Network Models	Explain the concept of various Network Model and protocols
CO3	Transmission Media	Explain the various types of transmission media
CO4	Physical Layer	Explain the structure and working of physical layer and solve problems related to transmission in physical layer.
CO5	Data Link Layer and Medium Access Sublayer	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-I and engage in a life-long learning.

**Course: Internet Programming- I (CS-334)**

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to web techniques	Explain web techniques to develop dynamic web pages by using server side scripting language PHP.
CO2	Functions & string in PHP Arrays in PHP	Explain different functions, string and array built in functions in php.
CO3	Introduction to Object Oriented Programming	Explain the class, object, inheritance & interface concepts in php.
CO4	Files and directories	Explain the random access to file data and directories.
CO5	Databases (PHP-PostgreSQL)	Explain different advanced database techniques
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Internet Programming- I and engage in a life-long learning.

**Course: Programming in Java-I (CS-335)**

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	An Introduction to Java An Overview of Java	Explain the datatypes, accept and display user inputs using command line in Java Programming..
CO2	Objects and Classes	Develop the classes and creating objects, by using Packages in Java.
CO3	Inheritance and Interface Exception Handling	Develop programs of inheritance and exception handling mechanism
CO4	Strings, Streams and Files	Develop program to perform Input/output operations using console and files.
CO5	User Interface Components with AWT and Swing Applet	Develop the GUI creation using Swing package and Layout managers and java applets
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Programming in Java-I and engage in a life-long learning.

**Course: Object Oriented Software Engineering(CS-336)**

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Object Oriented Concepts and Principles Introduction to UML	Explain importance of Object Orientation concepts and components of Unified Modelling Language

CO2	Basic Structural Modeling Advanced Structural Modeling Basic Behavioral Modeling	Explain the techniques and class diagrams related to basic and advanced structural modelling along with Behavioral Modeling
CO3	Object Oriented Analysis Object Oriented Design	Explain all the development process and design methods
CO4	Architectural Modeling	Design the Component, Collaboration and Deployment diagram with its entire notation.
CO5	Object Oriented Testing	Explain the techniques and strategies for testing.
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Object Oriented Software Engineering and engage in a life-long learning.

## Semester II

### Course: Operating Systems (CS-341)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction	Explain the fundamental components of a computer operating system.
CO2	Process Management Process Scheduling Process Synchronization	Explain the process management policies, scheduling of processes and evaluate the requirement for process synchronization
CO3	Multithreaded Programming	Analyze and design the applications to run in parallel either using process or thread models of different OS
CO4	Deadlocks Memory Management	Explain the concept of deadlocks in real life and the policies for memory management,
CO5	File System	Explain the policies for file systems.
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Operating Systems and engage in a life-long learning.

### Course: Compiler Construction (CS-342)

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction	Explain the design of a compiler including its phases and components
CO2	Lexical Analysis	Analyze the tokens to make the lexical analysis of program
CO3	Parser	Explain the different types of parsing techniques.
CO4	Syntax Directed Translation (SDT)	Explain the SDT schemes
CO5	Code Generation & Optimization	Analyze the program and minimize the code by using optimizing techniques which helps in reducing the no. of instructions in a program.
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of

		Compiler Construction and engage in a life-long learning.
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**Course: Computer Network II (CS- 343)**

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Wired LANs Wireless LAN	Explain the concepts regarding wired and wireless LAN.
CO2	The Network Layer	Explain the mechanism and devices used in the network layer.
CO3	Address Mapping	Explain the addresses needed in different layers.
CO4	The Transport Layer The Application Layer	Explain the host-to-host communication services for applications and application layer protocols.
CO5	Network Security	Explain the concept of network security.
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: Internet Programming- II (CS-344)**

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to web techniques	Explain various web techniques and dynamic web pages by using server side scripting language PHP.
CO2	Handling email with php	Develop the sending email also validating and verifying it.
CO3	PHP framework XML	Explain PHP frameworks and environments used for web designing along with various XML parsers used for websites.
CO4	WEB DESIGNING TECHNOLOGIES (JavaScript-DHTML)	Develop HTML web page and validating data accepted in HTML pages.
CO5	AJAX	Design the dynamic and interactive web sites by learning various recent web technologies
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Internet Programming- II and engage in a life-long learning.

**Course: Programming in Java-II (CS-345)**

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Collection	Explain the collections framework in java.
CO2	Database Programming	Develop the program to communicate with a database using java.
CO3	Servlet JSP	Explain the server-side programming and demonstrate the use of JSP.
CO4	Multithreading	Design the threads in java to demonstrate



		multithreading
CO5	Networking	Explain the connection oriented transmission – Stream Socket Class
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Programming in Java-II and engage in a life-long learning.

**Course: Computer Graphics (CS -346)**

At the end of the course following outcome is expected:

	Course unit Description	Outcome
CO1	Introduction to Computer Graphics Input Devices and Interaction tasks	Explain the computer graphics system and input devices and interactive tasks
CO2	Presentation and Output Device Raster Scan Graphics	Explain the Output Devices, presentations and Raster Scan Graphics, Scan Conversions, various line drawing algorithm
CO3	Transformations Clipping	Explain the transformation concepts and concepts of clipping, and different algorithms for polygon clipping
CO4	3D Transformation and Viewing	Explain the 3D transformation and concepts of 3D clipping
CO5	Hidden Surfaces elimination	Explain the need of elimination of Hidden Surfaces, algorithm based on object and image
CO6	Practical and Oral	Improve written, oral, and presentation communication skills related to the subject of Computer Graphics and engage in a life-long learning.