

# Pratibha College of Commerce & Computer Studies

## DEPARTMENT OF COMPUTER SCIENCE

### B. Sc. (CS) (2019 Pattern)

### Programme Outcomes

After successfully completing **B. Sc. (Computer Science)** Programme students will be able to:

<b>PO1</b>	<b>SCIENCE KNOWLEDGE:</b>	Apply the knowledge of mathematics, science, electronics, computer science fundamentals, and an specialization to the solution of complex science problems.
<b>PO2</b>	<b>PROBLEM ANALYSIS:</b>	Identify, formulate, research literature, and analyses complex problems reaching substantiated conclusions using principles of mathematics, natural sciences and computer sciences
<b>PO3</b>	<b>DESCRIBE DESIGN/DEVELOPMENT SOLUTIONS:</b>	<b>OF</b> Design solutions for complex computer science problems and design system components or processes or programs that meet the specified needs with appropriate consideration for public health and safety and cultural, societal, and environmental considerations. i.e to Discuss /design software development fundamentals, including programming, data structures, algorithms and complexity
<b>PO4</b>	<b>CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS:</b>	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. i.e Illustrate the concepts of systems fundamentals, including architectures and organization, operating systems, networking and communication

<b>PO5</b>	<b>MODERN TOOLS/SOFTWARE /PROGRAMMING LANGUAGE USAGE:</b>	Create, select, and apply appropriate techniques, resources, and modern IT tools, including prediction and modelling to complex activities, with an understanding of the limitations. i.e Gain the knowledge about software engineering fundamentals, including software analysis and design, evaluation and testing, and software engineering processes.
<b>PO6</b>	<b>ENVIRONMENT AND SUSTAINABILITY:</b>	Understand the impact of the professional IT solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
<b>PO7</b>	<b>ETHICS:</b>	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
<b>PO8</b>	<b>COMMUNICATION:</b>	Communicate effectively on complex activities with the science community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO9</b>	<b>INDIVIDUAL AND TEAM WORK:</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10</b>	<b>PROJECT MANAGEMENT AND FINANCE:</b>	Demonstrate knowledge and understanding of the project 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. i.e . Make use of fundamentals of Application, including information management and intelligent applications.
<b>PO11</b>	<b>Usage of Mathematics &amp; Statistics in computer science:</b>	Describe mathematics fundamentals, including discrete structures, statistics and calculus.
<b>PO12</b>	<b>Usage of Electronics in Computer Science:</b>	Illustrate the concepts of Microprocessors and microcontrollers.

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## DEPARTMENT OF COMPUTER SCIENCE

**B. Sc. (Computer Science) (FY SY TY 2019 Pattern),**

### Course Outcomes

#### **F. Y. B. Sc. (Computer Science)**

##### **Course (CS-111): Problem solving using Computer and C-Programming**

After successfully completing this course, students will be able to:

CO1:	Ability to implement algorithms and draw flowcharts for solving problems.
CO2:	Ability to understand computer programming language basic concepts.
CO3:	Ability to design and develop computer programs for decision making using various control structures.
CO4:	Able to learn and develop programs for usage of standard functions, user defined functions & recursive functions.
CO5:	Ability to learn array related concepts and applications.

##### **Course (CS-112) Database Management Systems**

After successfully completing this course, students will be able to:

CO1:	Define DBMS and structure of DBMS.
CO2:	Demonstrates Overview of DB design process,data models,constraints,Extended features.
CO3:	Describes query languages(DDL Commands,DML Commands) ,Set operations,Aggregate Operators and functions,Nested Subqueries,joining relations and Views.
CO4:	Discuss various terminologies and concept of normalization used in database .

### **Course (CS-121) Advanced ‘C’ Programming**

After successfully completing this course, students will be able to:

CO1:	Ability to learn concept of pointers and develop modular programs using pointers
CO2:	Ability to learn string related functions and use those concepts in C programs
CO3:	Ability to design and develop programs using structures and union using C.
CO4:	Ability to learn and develop programs for file handling using C
CO5:	Ability to understand concept of Preprocessor directives and Micro

### **Course (CS-122) Relational Database Management Systems**

After successfully completing this course, students will be able to:

CO1:	Define fundamental concepts of RDBMS (PL/PgSQL)
CO2:	Demonstrates Overview of Transaction Concepts and concurrency control.
CO3:	Describes Domain constraints, Referential Integritys and Security Concepts.
CO4:	Discuss various terminologies and concept of Crash Recovery .
CO5:	Define fundamental concepts of Other Databases

## MTC112 Discrete Mathematics

After successfully completing this course, students will be able to:

CO 1:	Explain the Concept of Propositional logic, which is concerned with all kinds of reasoning such as various application and important among these traditionally argumentation.
CO 2:	Understand and be able to specify and manipulate Various Boolean algebra, Properties of lattices.
CO 3:	Illustrate the use of these techniques in solving problems and equip students with the basic techniques of Counting.
CO 4:	Discuss & Explain various method of solving for variety of linear homogeneous and Non homogeneous recurrence relation with constant coefficients.
CO 5:	Student will able to Usages of basic operation related to arithmetic Opeators, solution of linear equation by using maxima software in practical way

## MTC 111 Matrix Algebra

After successfully completing this course, students will be able to:

CO 1:	Student is able to perform all matrix operations, solve examples and can give vector form of a matrix.
CO 2:	Students should know about Vectors in . The concept such as linear combination, span of vector with geometric interpretations in and . Also know about system of linear equation along with linear transformation.
CO 3:	Students should know the concept of basis of . The method of solving linear system using echelon forms, LU factorization, partitioning of matrices and rank of matrix and should be able to solve examples related to them.
CO 4:	Student should be able to find determinant, know the properties of determinants with help of examples and Application of determinant in area and volume, to solve a system of linear equations at the end

## MTC 121 Linear Algebra

After successfully completing this course, students will be able to:

CO1	Study the concept of vector spaces, subspaces, linearly dependent sets, bases, co-ordinate systems, the dimension of vector spaces.
CO2	Two new concepts as eigenvalues and eigenvectors is introduced to students. Study of characteristics of eigenvectors corresponding to the eigenvalues of matrix, diagonalization of a matrix related to eigenvalues and eigenvectors.
CO3	General dot product along with its properties and applications to symmetric matrices should be known to students. Use of inner product to find distance between two vectors, length of a vector etc.
CO4	Study of quadratic forms specially of symmetric matrices which are useful in engineering (image, processing, design criteria and optimization) along with these its interesting applications in Computer graphics.

## MTC122 Graph Theory

After successfully completing this course, students will be able to:

CO 1:	Students will know the process of fundamental concepts in agraph Theory.
CO 2:	Students develop an understanding the concepts of Connected Graph and related Algorithm.
CO 3:	Students can differentiate and identify of Eulerian and Hamiltonian Graphs.
CO 4:	Students develop an understanding the concepts of tree related Algorithm such as kruskal's algorithm and prim's algorithm.

## EI: ELC-111 Semiconductor Devices and Basic Electronic Systems

After successfully completing this course, students will be able to:

CO1:	Students are able to understand various types of semiconductor devices.
CO2:	Students are able to solve problems based on basing circuits.
CO3:	To develop familiarity with Components used to design Power supply.
CO4:	Students are able to understand different types of Osillators.
CO5:	To study elementary electronic circuits and systems.

## **EII:ELC 112 : Principle Of Digital Electronics**

After successfully completing this course, students will be able to:

CO1:	Introduce student with different number systems & with different interconversion number systems.
CO2:	Introduce student with different Boolean algebra rules, laws and theorem, different complex equation solving methods.
CO3:	Introduce students with how to design different digital systems, how to design combinational circuits & Designing of different applications using combinational circuits.

## **EI:ELC-121 Instrumentation System**

After successfully completing this course, students will be able to:

CO1:	Students are able to understand Instrumentation System.
CO2:	Introduce students with various blocks of Instrumentation System.
CO3:	Introduces student with different types of sensors and actuators.
CO4:	Student are able to understand OpAmp and their types.

## **EII:ELC 122 Basic Computer Organization**

After successfully completing this course, students will be able to:

CO1:	Introduce student with sequential circuits, and different flip flop circuit used to design digital systems.
CO2:	understand how to designs sequential circuits like shift register and counter and understand where its is used in real life means understand how to design application by using that circuits.
CO3:	To understand Basic Organization Systems
CO4:	To understand Memory Architecture.

## CSST 111 Descriptive Statistics

After successfully completing this course, students will be able to:

CO1	Students will be able to learn Basic concepts of Statistics and graphical representation of Data using Excel.
CO2	Students are able to find central and dispersion values in excel by calculations as well by using in built functions in Excel. Also interpretation of distribution of data. Problem solving. Students are also able to learn real life comparison of data by using coefficient of variation.
CO3	Students are able to interpretation of distribution of data (Skewed, semmetric, kurtosis) based on raw and central moments. Problrm solving.
CO4	Students will be able to learn how to deal with qualitative data. Analyse the data into qualitative and quantitative categories. Also association between qualitative attributes by using Yule's Coefficient.
CO5	Students are able to learn data collection through survey and analyze the data using statistical techniques and interpretation of that data

## CSST 112 Mathematical Statistics

After successfully completing this course, students will be able to:

CO1	Students will be able to learn Basic concepts of Probability. Also identify the deterministic and non-deterministic model. Unbiased experiment. Problem Solving
CO2	Students are able to find conditional probability using Bayes theorem. Understand the posterior and prior probabilities. Numerical problems solving related to real life situation.
CO3	Students are able to calculate the central values mean, median, mode, and S.D., variance and their properties. Also understand the Distribution funtion and their properties. Numerical problems solving related to real life situation
CO4	Students will be able to learn how to relate real problems to different types of distribution. And Fitting of distributions and their properties. problems solving related to real life situation
CO5	Students are able to learn basic statistics concepts and apply the various absic techniques of statistics to the analyze the data. All calculations are able to do in Excel software also.



## CSST 121 Method of Applied Statistics

After successfully completing this course, students will be able to:

CO1	Students will be able to learn What Scatter Diagram is and through graph interpretation of data which type of correlation (Positive, Negative or No correlation) is there. Also calculate the calculate the correlation coefficient using formula.
CO2	Students are able understand the linear relationship and non-linear relationship of variables and fit the proper regression line. Which regression is better for given data set through scatter diagram and by fitting the regression line. Also able to learn linear regression properties.
CO3	Students are able to learn fitting of regression line for one dependent and more than two independent variables. Also able to learn how to calculate Muliple and partial correlation coefficient and their coefficient of determination. Also learn their properties and real life applications.
CO4	Students will be able to learn meaning of utility and time series components. Where to use additive and multiplicative models. Also able to learn methos of estimating trend (Method of Moving average, exponential smoothing method). And Real life applications of time series.

## CSST 122 Continuous Probability Distributions and Testing of Hypothesis

After successfully completing this course, students will be able to:

CO1	Students will be able to learn the various continuos distributions (Uniform, Exponential, Pareto, Normal) their mean, variance and pdf. Also able to learn how these distributions are useful in day to day life. Students will also learn to solve numericals problems based on these distributions.
CO2	Students will able understand the concepts of testing of hypothesis and definition (Type I error, TypeII error, level of significance, critical region) related to testing of hypothesis. Also able to learn the concept of null and alternative hypothesis (one sided and two sided)
CO3	Students will able to learn large sample tests, Test based on t-distribution(Paired t-test, ), test based on F-distribution, test based on Chi-square distribution. Also able to learn which test is suitable for given data sets. Also able to learn Real life applications and to solve numerical problems based on real life situations.
CO4	Students will able to learn simulation techniques (Linear congruential generator) for data generation using different types of distributions (From Uniform, exponential, Normal). Also able to learn concept of simulation , random numbers, pseudo random numbers , Advantages , Disadvantages of Simulation.

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### Course Outcomes

#### S. Y. B. Sc. (Computer Science)

##### CS-231 Data Structures and Algorithms – I

After successfully completing this course, students will be able to:

CO1:	To understand that the data structure and the analysis of algorithm.
CO2:	To discriminate the usage of various structures in approaching the problem solution.
CO3:	To differentiate the usage of various structures in problem solution like linked list in various Computer domain problems.
CO4:	To analyze the problems and apply data structure like Stack for memory management , backtracking ,expression evaluation
CO5:	To use of data structures in various real time applications.

##### CS-232 Software Engineering

After successfully completing this course, students will be able to:

CO1:	Students will able to compare and choose a process model for a software project development.
CO2:	Students can identify requirements of software, analyze it and prepare models.
CO3:	Students able to prepare the SRS, Design document, Project plan of a given software system.
CO4:	Students have ability to identify Software Development Life Cycle which is required for Software application development process
CO5:	Students are able to compare various Software Development Process Models
CO6:	Students able to implement the software engineering concepts like Fact finding techniques, system analysis and designing in Semester Projects.
CO7:	Students able to design SRS (System Requirement Specification) for Projects.
CO8:	Students have ability to depict the system through DFD (Data Flow Diagrams) and various tools required for designing systems.

## **CS-241 Data Structures and Algorithms – II**

After successfully completing this course, students will be able to:

CO1:	To learn the systematic way of solving problems using tree data structure
CO2:	To design algorithms regarding applications of tree AVL Tree,Red black,Mutiway tree
CO3:	To understand the different methods of organizing large amount of data
CO4:	To efficiently implement the non-linear data structures

## **CS-242 Computer Networks – I**

After successfully completing this course, students will be able to:

CO1:	To understand the concept of Networking, its architecture and to Illustrate the functionality of OSI and TCP/IP reference models with good knowledge of Layers.
CO2	To understand the working of lower layers , Framing Methods and design issues and study LAN structures
CO3	To learn mechanisms involved in Network layer services including protocols and demonstrate various types of routing techniques
CO4	To study services provided by Transport layer and involved protocols

## **EL231 :MicrocontrollerArchitecture & Programming**

After successfully completing this course, students will be able to:

CO1:	Student is able to describe the internal architecture of 8051 & to understand memory interface
CO2:	Student is able to understand different addressing modes and instructions of 8051
CO3:	To understand and solve problems using timer and counters in 8051and Student is able to design and develop assembly language programs .
CO4:	Student is able to interface I/O peripherals to 8051 microcontroller

## **EL232:Digital Communication and Networking**

After successfully completing this course, students will be able to:

CO1. Student will be able to Define and explain terminologies of data communication
CO2. Student will be able to Understand the impact and limitations of various digital modulation techniques
CO3. Students will be able to acknowledge the need of spread spectrum schemes.
CO4. Student will be able to Identify functions of data link layer and network layer while accessing communication link
CO5. Student will be able to choose appropriate and advanced techniques to build the computer network

## **EL241 :Embedded System Design**

After successfully completing this course, students will be able to:

CO1	To understand the concept of Embedded systems using single board computers.
CO2	Student is able to describe the architecture of System on Chip and to understand the use of Single board Computer (Such as Raspberry Pi) for an embedded system application.
CO3	Familiar with the programming environment to develop embedded systems and their interfaces with peripheral devices.
CO4	To develop familiarity with tools used to develop in an embedded environment.

## **EL242:Wireless Communication and Internet of Things**

After successfully completing this course, students will be able to:

CO1. Students will be able to know working of wireless technologies such as Mobile communication, GSM, GPRS.
CO2. Students will be able to become familiar with 3G and 4G Cellular Network Technologies for Data Connections.
CO3. Students will be able to understand working principles of short range communication application.
CO4. Students will be able to get introduced to upcoming technology of the Internet of Things.
CO5. Students will be able to explore themselves and develop new IoT based applications.

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### Course Outcomes

#### T. Y. B. Sc. (Computer Science)

##### Sem-V CS-351 Operating System-I

After successfully completing this course, students will be able to:

CO1:	Ability to understand concept of Operating System & Functions of OS
CO2	Ability to understand Concepts Process & threads
CO3:	Able to understand Process scheduling algorithm & able to find the Turn around time using different process scheduling algorithms like FCFS,SJF,Priority,RR
CO4:	Ability to Concept of Process Synchronization,Semaphore concepts
CO5:	Able to understand concept of memory management,Paging Segmentation,Page replacement algorithms FIFO,LRU,MRU,LFU,MFU,OPTIMAL Page replacement Algorithm.

##### Course Code : CS – 352 Course Title :Computer Networks – II:

After successfully completing this course, students will be able to:

CO1	To understand different protocols of application layer.
CO2	To understand concepts of multimedia.
CO3	Explore the different methods used for Network/INTERNET security.

### CS-353 Web Technology I:

After successfully completing this course, students will be able to:

<b>CO1:</b>	Ability to understand Basics of Web Techniques ,HTML, HTTP and PHP
<b>CO2</b>	Ability to understand basics of Function and String and their uses
<b>CO3:</b>	Able to <b>understand</b> use of Arrays in php and its implementation.
<b>CO4:</b>	Ability to understand the Files and database handling
<b>CO5:</b>	Able to understand Handling email with php

### Course Code: CS – 354 Paper Title : Foundations of Data Science:

After successfully completing this course, students will be able to:

<b>CO1:</b>	Perform Exploratory Data Analysis
<b>CO2</b>	Obtain, clean/process, and transform data.
<b>CO3:</b>	Detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization.
<b>CO4:</b>	Demonstrate proficiency with statistical analysis of data.
<b>CO5:</b>	Present results using data visualization techniques.

### CS-355 Object Oriented Programming Using JAVA-I:

After successfully completing this course, students will be able to:

<b>CO1:</b>	Ability to understand features & concepts of java, JVM architecture, data types and accepting input & its usage
<b>CO2</b>	Ability to understand object & class concept, use and creation of packages and its applications
<b>CO3:</b>	Able to <b>understand</b> use of Inheritance and Interface in java and its implementation.
<b>CO4:</b>	Ability to understand the files, reading and writing to and from various sources with implementation and basics of error and exception handling
<b>CO5:</b>	. Able to <b>design &amp; develop</b> GUI based applications using AWT & Swing

**CS-356 - Theoretical Computer Science:**

After successfully completing this course, students will be able to:

<b>CO1:</b>	Ability To understand the Finite Automata
<b>CO2</b>	Ability To understand the Regular Language.And relation between Automaton and Language
<b>CO3:</b>	Ability To understand the Regular Language, Context Free Language, Context Sensitive Language and Unrestricted Language
<b>CO4:</b>	Able To understand the Pushdown Automata
<b>CO5:</b>	Able To understand the Turing Machine.

**Course Type: SECC – I Course Code : CS-3510 Course Title: Python Programming**

After successfully completing this course, students will be able to:

<b>CO1</b>	Develop logic for problem solving
<b>CO2</b>	Determine the methods to create and develop Python programs by utilizing the data structures like lists,dictionaries, tuples and sets.
<b>CO3</b>	To be familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc.
<b>CO4</b>	To write python programs and develop a small application project

**Course Type: SECC – I Course Code : CS-3511 Course Title: Blockchain Technology**

After successfully completing this course, students will be able to:

CO1:	Ability to understand concept of Blockchain Technology, Benefits, Essentials of Blockchain (Blockchain generations, types of blockchain, benefits and challenges of blockchain usage, Types of Networks, Layered Architecture of Blockchain Ecosystem, Components of blockchain, Cryptography (private and public keys, Hashing & Digital Signature), Consensus Mechanisms, Cryptocurrency, Digital Currency Bitcoin and Ethereum
CO2	Understanding concept of SHA256 Hash, Immutable Ledger, Distributed P2P Network, How Mining Works? (The NONCE and Cryptographic Puzzle), Byzantine Fault Tolerance, Consensus Protocols: Proof of Work, Proof of State, Défense Against Attackers, Competing Chains, Blockchain Demo
CO3:	Able to understand Ethereum Network, What is a Smart Contract?, Ether, Gas, Ethereum Virtual Machine, DApps Decentralized Autonomous Organizations (DAO), Hard and Soft Forks, Initial Coin Offerings, Demo of Smart Contracts



## Sem-VI CS-361 Operating System-II:

After successfully completing this course, students will be able to:

<b>CO1:</b>	Ability to understand concept of deadlock and Deadlock handling methods,to solve examples on Bankers Algorithms
<b>CO2</b>	Ability to understand Concepts of file allocation methods, Sequential file allocation, linked file allocation, index file allocation.
<b>CO3:</b>	Able to <b>understand</b> Disk scheduling algorithm & able to find the seek time using different disk scheduling algorithms like FCFS,SSTF,SCAN,LOOK,CSCAN,CLOOK.
<b>CO4:</b>	Ability to understand Concept of distributed operating system,types of Distributed OS
<b>CO5:</b>	Able to understand concepts of <b>mobile os,Examples of mobile os blackberry, apple,android,palm,Symbian</b>

## Course Code: CS – 362 Software Testing:

After successfully completing this course, students will be able to:

<b>CO1:</b> To understand various software testing methods and strategies.
<b>CO2:</b> To understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software.
<b>CO3:</b> To design test cases and test plans, review reports of testing for qualitative software.
<b>CO4:</b> To understand latest testing methods used in the software industries.

**Course Code: CS – 363 Web Technology – II:**

After successfully completing this course, students will be able to:

<b>CO1:</b>	Ability to understand Introduction to Web Techniques and their implementation.
<b>CO2</b>	Ability to understand XML concepts and develop it's applications.
<b>CO3:</b>	Ability to understand Java Script and JQuery and develop it's applications
<b>CO4:</b>	Able to understand, design & develop web applications using AJAX.
<b>CO5:</b>	Able to understand PHP framework CodeIgniter framework.

**Course Code: CS – 364 Course Title : Data Analytics:**

After successfully completing this course, students will be able to:

<b>CO1:</b>	Use appropriate models of analysis, assess the quality of input, and derive insight from results.
<b>CO2</b>	Analyze data, choose relevant models and algorithms for respective applications
<b>CO3:</b>	Understand different data mining techniques like classification, prediction, clustering and association rule mining
<b>CO4:</b>	Apply modeling and data analysis techniques to the solution of real world business problems

**Course Code: CS – 365 Object Oriented Programming Using JAVA-II:**

After successfully completing this course, students will be able to:

<b>CO1:</b>	Ability to understand all types of collection classes, interfaces and their implementation.
<b>CO2</b>	Ability to understand multithreading concepts and develop multithreaded applications.
<b>CO3:</b>	Ability to understand database programming concepts and developed database applications
<b>CO4:</b>	Able to understand, design & develop web applications using servlets and JSP.
<b>CO5:</b>	Able to understand spring framework.

**Course Code: CS - 366 - Compiler Construction :**

After successfully completing this course, students will be able to:

<b>CO1:</b>	Ability to understand Definition of Compiler, Aspects of compilation.
<b>CO2</b>	To understand design issues of a lexical analyzer and use of LEX tool, YACC tool.
<b>CO3:</b>	Understand the process of scanning and parsing of source code and design issues of a parser.
<b>CO4:</b>	Learn the conversion code written in source language to machine language.
<b>CO5:</b>	To understand and design code generation and optimization techniques

**Course Code-3610 Software Testing Tools :**

After successfully completing this course, students will be able to:

<b>CO1:</b>	Ability to understand concept of Test cases & manual testing method using MS Excel
CO2	Able to design test cases for simple programs
<b>CO3:</b>	Able to understand the concepts of the test plan with examples.
CO4:	Ability to design defect report & study life cycle of defect report.
<b>CO5:</b>	Able to understand the software testing tools,selenium webdriver tool

**Course Code - 3611 – Project:**

After successfully completing this course, students will be able to:

CO-1	To understand project characteristics and various stages of a project.
CO-2	To enable students to implement Project Planning in their Project work.
CO-3	To make them understand the concepts of Project Management for planning to execution of projects
CO-4	To understand various programming languages and implement them to make an application.