

**CHRIST COLLEGE PUNE**  
**DEPARTMENT OF SCIENCE**

**Programme Outcome**

After the successful completion of three-year BSC (CS) Programme, the graduate will be able to:

**PO1:** To develop problem solving abilities using computer

**PO2:** To build the necessary skill set and analytical abilities for developing computer-based solutions

**PO3:** To create awareness about process and product standards

**PO4:** To train students in professional skills related to software industry

## Bachelor of Science (Computer Science)

### Semester I

Course Code	Course Title	Course Outcome
CS-111	<b>Problem Solving using Computer and 'C' Programming</b>	<ol style="list-style-type: none"><li>1. Explore algorithmic approaches to problem solving.</li><li>2. Develop modular programs using control structures and arrays in 'C'.</li></ol>
CS-112	<b>Database Management Systems</b>	<ol style="list-style-type: none"><li>1. Solve real world problems using appropriate set, function, and relational models.</li><li>2. Design E-R Model for given requirements and convert the same into database tables.</li><li>3. Adapt SQL</li></ol>
MTC-111	<b>Matrix Algebra</b>	<ol style="list-style-type: none"><li>1. Organize large amount of data in the form of matrices</li><li>2. Perform basic matrix operations</li><li>3. Solve simple linear equations using matrices</li></ol>
MTC-112	<b>Discrete Mathematics</b>	<ol style="list-style-type: none"><li>1. Identify certain parameters and properties of the given graphs.</li><li>2. Design certain algorithms based on Boolean Algebra</li></ol>
ELC-111	<b>Semiconductor Devices and Basic Electronic Systems</b>	<ol style="list-style-type: none"><li>1. Define and explain electronics components</li><li>2. Relate working of semiconductor devices</li><li>3. Develop working of Power supply</li></ol>

		<ol style="list-style-type: none"> <li>4. Examine working of OSCILLATORS</li> <li>5. Choose appropriate and advanced techniques for data conversion</li> </ol>
<b>ELC-112</b>	<b>Principles of Digital Electronics</b>	<ol style="list-style-type: none"> <li>1. Assess interconversion of various number systems.</li> <li>2. Design and simplify K-maps</li> <li>3. Evaluate and design encoders and decoders.</li> </ol>
<b>CSST-112</b>	<b>Mathematical Statistics</b>	<ol style="list-style-type: none"> <li>1. Solve counting problems related to permutations and combinations using counting principles</li> <li>2. Assess probability theory in modelling and understanding modern definition of probability.</li> <li>3. Identify various probability models.</li> <li>4. Discover numerical problems related to real life situation</li> </ol>
<b>CSST-111</b>	<b>Descriptive Statistics</b>	<ol style="list-style-type: none"> <li>1. Learn to describe and summarize data using appropriate measures of central tendency, such as mean, median, and mode.</li> <li>2. Understand measures of data variability, including range, variance, and standard deviation, to assess the spread of data points.</li> <li>3. Calculate and interpret percentiles and quartiles to understand data distribution and identify outliers.</li> </ol>

## Semester II

<b>Course Code</b>	<b>Course Title</b>	<b>Course Outcome</b>
<b>CS-121</b>	<b>Advanced 'C' Programming</b>	<ol style="list-style-type: none"> <li>1. Recall the basic concepts of 'C' Programming</li> <li>2. Understand code organization with complex data types and structures.</li> </ol>

		<p>3. Develop modular programs using control structures, pointers, arrays, strings and structures.</p> <p>4. Differentiate various types of outputs.</p>
<b>CS-122</b>	<b>Relational Database Management Systems</b>	<p>1. Classify and explain the database concepts like data types, operators and control statements.</p> <p>2. Apply the database concepts in writing PL/SQL programs.</p> <p>3. Distinguish between DBMS and RDBMS</p> <p>4. Select from various programming constructs like cursors, triggers, functions and procedures and use them while creating programs.</p> <p>5. Create and organise data in tables and make modifications through PL/SQL programs</p>
<b>MTC-121</b>	<b>Linear Algebra</b>	<p>1. Recall the concept of Vector Spaces .</p> <p>2. Compute basis of given vector spaces.</p> <p>3. Solve the system of linear equations using the gaussian elimination method.</p> <p>4. Represent different isomorphisms of vector spaces using linear transformation.</p> <p>5. Apply Rank-Nullity Theorem for computations of dimension of vector spaces</p>
		<p>1. Understand the concept of Vector Spaces.</p> <p>2. Compute basis of given vector spaces.</p>

<b>MTC-122</b>	<b>Graph Theory</b>	<ol style="list-style-type: none"> <li>3. Solve the system of linear equations using the gaussian elimination method.</li> <li>4. Represent different isomorphisms of vector spaces using linear transformation.</li> <li>5. Apply Rank-Nullity Theorem for computations of dimension of vector spaces.</li> </ol>
<b>ELC-122</b>	<b>Basics of Computer Organisation</b>	<ol style="list-style-type: none"> <li>1. Explain the working of sequential circuits.</li> <li>2. Compare and identify the basics of computers.</li> <li>3. Develop the understanding and identifying the memory architecture.</li> <li>4. Design their own model using basic knowledge of digital electronic</li> </ol>
<b>CSST-121</b>	<b>Methods Of Applied Statistics</b>	<ol style="list-style-type: none"> <li>1. Explain the basic concepts of applied statistics.</li> <li>2. Analyse the data using correlation and regression</li> <li>3. Demonstrate the method for solving real life problems using multiple regression and multiple, partial correlation.</li> <li>4. Formulate real life problems as relevant statistical problems and find the solution using methods of time series</li> </ol>

<b>CSST-122</b>	<b>Continuous Probability Distributions and Testing of Hypothesis</b>	<ol style="list-style-type: none"> <li>1. Understand standard continuous probability distributions.</li> <li>2. Compute probabilities, expected values and variance of standard continuous probability distributions.</li> <li>3. Apply standard continuous probability distributions to solve real life problems based on given data.</li> <li>4. Implement testing of hypothesis in decision making situation.</li> <li>5. Create optimum model against which given data needs to be tested.</li> </ol>
<b>ELC-121</b>	<b>Instrumentation System</b>	<ol style="list-style-type: none"> <li>1. Infer the fundamental principles of measurement, including accuracy, precision, sensitivity, and linearity.</li> <li>2. Familiarize yourself with common measurement instruments, such as voltmeters, ammeters, and oscilloscopes</li> <li>3. Explore digital communication protocols used in instrumentation systems, such as Modbus and HART.</li> </ol>

### Semester III

<b>Course Code</b>	<b>Course Title</b>	<b>Course Outcome</b>
<b>CS-231</b>	<b>Data Structures and Algorithms – I</b>	<ol style="list-style-type: none"> <li>1. Interpret organized data structures in PS.</li> <li>2. Differentiate the usage of various structure in PS.</li> <li>3. Implementing algorithms to solve problems using DS.</li> </ol>
<b>CS-232</b>	<b>Software Engineering</b>	<ol style="list-style-type: none"> <li>1. Compare and chose a process model for a software project development.</li> <li>2. Identify requirements analyze and prepare models.</li> <li>3. Prepare the SRS, Design document, Project plan of a given software system</li> </ol>

<b>MTC-231</b>	<b>Group Theory</b>	<ol style="list-style-type: none"> <li>1. Differentiate between equivalence relation and congruence relation on <math>Z</math></li> <li>2. Identify groups and its elementary properties</li> <li>3. Explore the properties of finite groups and subgroups</li> </ol>
<b>MTC-232</b>	<b>Numerical Analysis</b>	<ol style="list-style-type: none"> <li>1. Develop methods like Newton-Raphson, false position while solving algebraic and transcendental equations.</li> <li>2. Apply methods like Newton's interpolation, LaGrange's interpolation while solving interpolation problem.</li> <li>3 Implement methods like Trapezoidal Rule, Simpson's One-Third Rule, Simpson's Three-Eight Rule while finding numerical values of integration</li> <li>4. Examine methods like Euler's Method, Modified Euler's Method, Runge-Kutta Method while solving ordinary differential equations</li> </ol>
<b>ELC-231</b>	<b>Microcontroller Architecture and programming</b>	<ol style="list-style-type: none"> <li>1. Classify programs for 8051 microcontroller</li> <li>2. Interface I/O peripherals to 8051 microcontroller</li> <li>3. Design small microcontroller based projects</li> </ol>
<b>ELC-232</b>	<b>Digital Communication and Networking</b>	<ol style="list-style-type: none"> <li>1. Define and explain terminologies of data communication</li> <li>2. Understand the impact and limitations of various digital modulation techniques</li> <li>3. Acknowledge the need of spread spectrum schemes</li> <li>4. Identify functions of data link layer and network layer while accessing communication link</li> <li>5. Choose appropriate and advanced techniques to build the computer network</li> </ol>
<b>23921</b>	<b>Environment Science –I</b>	<ol style="list-style-type: none"> <li>1. Explain the importance of preserving and protecting our Mother Earth.</li> <li>2. Guide the next generation.</li> </ol>

23922	<b>Language Communication – I</b>	<ol style="list-style-type: none"> <li>1. Develop Reading, Writing, Speaking and Listening Skills.</li> <li>2. Compare certain rules of grammar</li> <li>3. Develop personality by instilling core values; life skills.</li> <li>4. Identify soft skills.</li> </ol>
-------	-----------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Semester IV**

<b>Course Code</b>	<b>Course Title</b>	<b>Course Outcome</b>
CS-242	<b>Computer Networks - I</b>	<ol style="list-style-type: none"> <li>1. Recall the basic concept of Networking(LAN,MAN,WAN, Protocols)</li> <li>2. Develop the OSI and TCP/IP Reference Models and in particular have a good knowledge of lower Layers vs Upper layers and also working of various protocols.</li> <li>3. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.</li> </ol>
		<ol style="list-style-type: none"> <li>1. Understand 2 and 3 dimensional transformations.</li> <li>2. Compute matrices of two and three dimensional transformations.</li> <li>3. Apply transformations and projections in computer science.</li> </ol>



<p style="text-align: center;"><b>MTC-241</b></p>	<p style="text-align: center;"><b>Computational Geometry</b></p>	<p>4. Represent different equations of planes and curves in three dimensions.</p> <p>5. Create animation videos using transformations and curves in three dimensions.</p>
<p style="text-align: center;"><b>MTC-242</b></p>	<p style="text-align: center;"><b>Operations Research</b></p>	<p>1. Explain the basic concepts of operations research.</p> <p>2. Solve LPP using various methods.</p> <p>3. Demonstrate the method for solving assignment problems and transportation problems.</p> <p>4. Formulate real life problems as relevant LPP and find the solution using appropriate method.</p>
<p style="text-align: center;"><b>ELC-241</b></p>	<p style="text-align: center;"><b>Embedded System Design</b></p>	<p>1. Differentiate between general computing and embedded systems.</p> <p>2. Relate the fundamentals of embedded systems.</p> <p>3. Develop familiarity with tools used to develop in an embedded environment</p> <p>4. Design their own model using a Single board Computer (Such as Raspberry Pi) for an embedded system application.</p> <p>5. Design embedded systems and their interfaces with peripheral devices.</p>

<p style="text-align: center;"><b>ELC-242</b></p>	<p style="text-align: center;"><b>Wireless Communication and Internet of Things</b></p>	<ol style="list-style-type: none"> <li>1. Understand working of wireless technologies such as Mobile communication, GSM, GPRS ,3G and 4G Cellular Network Technologies</li> <li>2. Apply short-range communication in various applications</li> <li>3. Experiment above knowledge for data communication</li> <li>4. Evaluate the concept of Internet of Things</li> <li>5. Design new IoT based application</li> </ol>
<p style="text-align: center;"><b>24921AECC1</b></p>	<p style="text-align: center;"><b>Environment Science – II</b></p>	<ol style="list-style-type: none"> <li>1. Make use of awareness in the society about the protection of the environment.</li> <li>2. Create awareness about natural resources, ecosystem, biodiversity and its conservation in urban, rural, industrial, agricultural areas.</li> <li>3. Discuss issues related to society, human population, environmental pollution etc.</li> <li>4. Investigate scope of renewable energy</li> </ol>
<p style="text-align: center;"><b>CS-241</b></p>	<p style="text-align: center;"><b>Data Structures &amp; Algorithms - II</b></p>	<ol style="list-style-type: none"> <li>1. Learn about advanced data structures such as heaps, hash tables, balanced trees (e.g., AVL trees, Red-Black trees), and graphs.</li> <li>2. Understand the principles of dynamic programming and apply it to solve complex problems, including optimization problems and sequence alignment.</li> </ol>
<p style="text-align: center;"><b>24922</b></p>	<p style="text-align: center;"><b>Language Communication II</b></p>	<ol style="list-style-type: none"> <li>1. Develop a higher level of proficiency in the target language, including improved speaking, listening, reading, and writing skills.</li> <li>2. Achieve greater fluency in spoken language through practice in real-life situations and discussions.</li> </ol>

		3. Enhance reading comprehension skills to understand more complex texts and literature.
--	--	------------------------------------------------------------------------------------------

### Semester V

<b>Course Code</b>	<b>Course Title</b>	<b>Course Outcome</b>
<b>CS-351</b>	<b>Operating Systems - I</b>	<ol style="list-style-type: none"> <li>1. Assess concept of operating system and its principle</li> <li>2. Analyze processes and Thread Scheduling by operating system</li> <li>3. Create synchronization in process and threads by operating system</li> <li>4. Design memory management by operating system using with the help of various schemes</li> </ol>
<b>CS-352</b>	<b>Computer Networks – II</b>	<ol style="list-style-type: none"> <li>1. Understand the different protocols of Application layer.</li> <li>2. Develop understanding of technical aspect of Multimedia Systems.</li> <li>3. Relate various Multimedia Systems applicable in real time.</li> <li>4. Identify information security goals.</li> <li>5. Compare and apply cryptographic techniques for data security</li> </ol>
<b>CS-353</b>	<b>Web Technologies – I</b>	<ol style="list-style-type: none"> <li>1. How to develop dynamic and interactive Web Page</li> <li>2. Create well-structured web pages using HTML.</li> <li>3. Implement user authentication and authorization mechanisms</li> </ol>
		1. Perform Exploratory Data Analysis

<b>CS-354</b>	<b>Foundations of Data Science</b>	<ol style="list-style-type: none"> <li>2. Obtain, clean/process, and transform data.</li> <li>3. Detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization.</li> <li>4. Demonstrate proficiency with statistical analysis of data.</li> <li>5. Present results using data visualization techniques.</li> </ol>
<b>CS-355</b>	<b>Object Oriented Programming - I (Core Java)</b>	<ol style="list-style-type: none"> <li>1. Understand the concept of Object-Oriented Programming such as classes, objects, Packages, and Collections.</li> <li>2. Develop Web-based applications and GUI-based Applications.</li> <li>3. Design event-driven Applications.</li> </ol>
<b>CS-356</b>	<b>Theoretical Computer Science and Compiler Construction - I</b>	<ol style="list-style-type: none"> <li>1. Recall the Finite Automata, Pushdown Automata and Turing Machine.</li> <li>2. Evaluate the Regular Language, Context Free Language, Context Sensitive Language and Unrestricted Language.</li> <li>3. Explain the relation between Automaton and Language</li> </ol>
<b>CS-3510</b>	<b>Python Programming</b>	<ol style="list-style-type: none"> <li>1. Develop logic of problem-solving using python</li> <li>2. Evaluate various Data Structures like List</li> <li>3. Familiarize with Basic control structures, loops &amp; tune?</li> <li>4. Develop small Application Project.</li> </ol>
<b>CS-3511</b>	<b>Blockchain Technology</b>	<ol style="list-style-type: none"> <li>1. Learn Fundamentals of Blockchain Technology.</li> <li>2. Learn Blockchain Programming.</li> <li>3. Demonstrate basic knowledge of smart contracts &amp; how they function</li> </ol>

**Semester VI**

<b>Course Code</b>	<b>Course Title</b>	<b>Course Outcome</b>
<b>CS-361</b>	<b>Operating Systems – II</b>	<ol style="list-style-type: none"><li>1. Compare deadlock concepts and file handling techniques.</li><li>2. Apply disk scheduling algorithms in process management</li><li>3. Analyse the working of distributed and mobile O.S.</li></ol>
<b>CS-362</b>	<b>Software Testing</b>	<ol style="list-style-type: none"><li>1. Define various software testing methods and strategies.</li><li>2. Compare a variety of software metrics and latest testing methods used in the software industries.</li><li>3. Identify defects and manage those defects for improvement in quality for given software.</li><li>4. Design test cases and test plans, review reports of testing for qualitative software.</li></ol>
<b>CS-363</b>	<b>Web Technologies – II</b>	<ol style="list-style-type: none"><li>1. Recall the basic concepts of HTML, CSS, PHP</li><li>2. Remember basic concepts of JavaScript, XML, jQuery, cookies, session, Ajax, CodeIgniter</li><li>3. Analyse the difference between server-side Application and client-side Application</li></ol>

		4. Create dynamic website. Using MVC based framework, students will make design and handle the errors in dynamic Website
<b>CS-364</b>	<b>Data Analytics</b>	<p>1. Utilize knowledge and skills to continue learning and adapting to new data science technologies.</p> <p>2. Acquire the fundamental understanding of the analytical techniques and software tools necessary to effectively generate useful information from structured and unstructured datasets of any size.</p> <p>3. Demonstrates the ability to technical skills in predictive and prescriptive modelling to support decision making based on data analytics.</p> <p>4. Evaluate to the basics of programming and analytics software used to the solution of real-world business problems.</p>
<b>CS-365</b>	<b>Object Oriented Programming using Java – II</b>	<p>1. Recall basic concepts of Database programming, Collection Framework, Multithreading, and dynamic web pages using Servlets and JSP and also basics Spring Framework.</p> <p>2. Analyze the difference between Java Application and Web Application</p> <p>3. Create application using Multithreading concepts, database application using JDBC and web application using Servlets and Spring Framework.</p>

<b>CS-3610</b>	<b>Software Testing Tools</b>	<ol style="list-style-type: none"><li>1. Define various software testing methods and strategies.</li><li>2. Evaluate a variety of software metrics and latest testing methods used in the software industries.</li><li>3. Identify defects and manage those defects for improvement in quality for given software.</li><li>4. Design test cases and test plans, review reports of testing for qualitative software</li></ol>
<b>CS-366</b>	<b>Compiler Construction</b>	<ol style="list-style-type: none"><li>1. Remember of the overall structure and components of a compiler, including lexical analysis, parsing, semantic analysis, optimization, and code generation.</li><li>2. Explore semantic analysis to check and enforce the correctness of program semantics, including type checking and error handling.</li><li>3. Develop techniques for managing symbol tables, which store information about variables, functions, and other program entities.</li><li>4. Design and implement test cases and techniques for thoroughly testing the compiler to ensure its correctness and robustness.</li></ol>