Deccan Education Society's

Fergusson College (Autonomous), Pune

Program Specific Outcomes(PSOs) and Course Outcomes (COs) 2019-20

Department of Computer Science
Programme: B.Sc. Computer Science

PSO No.	Program Specific Outcomes (PSOs) Upon completion of this programme the student will be able to
PSO1	**Academic Competence:** (i) Understand various concepts of Computing, Statistics, Mathematics and Electronics appropriately to the discipline. (ii) Recommend computing solutions to solve the problems in different domains
PSO2	**Personal and Professional Competence:** (i) Apply the fundamental knowledge for professional software development as well as to acquire new skills. (ii) Develop strong problem solving, analysing and decision-making abilities. Identify the information and apply their disciplinary knowledge and professional skills to design components , system or processes to meet required specification
PSO3	**Research Competence:** (i) Apply programming languages, tools and techniques to conduct research and demonstrate appropriate emerging skills to seek solutions to problems in various interdisciplinary fields. (ii) Integrate Computer Science, Electronics, Mathematical and Statistical knowledge to explore different domains' data for experimental and research purpose
PSO4	**Entrepreneurial and Social Competence:** (i) Use the knowledge and skills necessary to support their career in software development, web development, databases and entrepreneurship in recent trends like data analytics, artificial intelligence, Image processing, Networking, Embedded systems etc. (ii) Develop software based solutions for industry as well as research and development and develop skills required for social interaction.

Course Outcomes (COs)		
F.Y. B.Sc. Semester I		
Title of the Course and Course Code	**Basic Programming using C (CSC1101)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify and define appropriate solutions to problems in the field of computer science and other related disciplinary areas.	1
CO2	Illustrate the solutions to the problems in the form of simple algorithms and flowcharts.	2
CO3	Apply various computer programming language concepts and strategies to write and execute efficient and structured computer programs.	3
CO4	Analyze and compile the programs to detect any errors, debug and correct the programs.	4
CO5	Test and perform critical evaluation of the program outcome to validate the program logic.	5
CO6	Integrate the concepts of control structures, functions and arrays to create more complex programming solutions.	6
Title of the Course and Course Code	**Database Management System: SQL (CSC1102)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify the databases and relationships between them by analyzing the information.	1
CO1	Discuss database concepts, applications, data models in the field of computer science along with other areas and develop the design of database.	2
CO3	Apply the knowledge of database concepts with normalization to write and execute the queries and operations in SQL.	3
CO4	Integrate the concepts of queries, joins, aggregate functions in SQL.	4
CO5	Test the queries and operations to detect the errors.	5
CO6	Develop the strong ability to use the database concepts for writing queries and operations in SQL.	6
Title of the Course and Course Code	**Computer Science Practical – I (CSC1103)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's**

		Cognitive level
CO1	Define algorithms and flowcharts for given problems in C programming. Describe an information model expressed in the form of an entity-relationship diagram.	1
CO2	Illustrate the use of simple data types, operators and control structures in C programming. Transform entity-relationship diagram into a relational database schema.	2
CO3	Implement various standard library functions in C programming and SQL data definition in database.	3
CO4	Divide the programs into separate modules by writing user-defined functions. Organize the database using constraints and schema.	4
CO5	Evaluate the programs and DBMS queries using appropriate debugging methods to test and validate the output.	5
CO6	Design and write programs to implement the concepts of functions, arrays in C programming and queries, aggregate functions in DBMS.	6
Title of the Course and Course Code	**Descriptive Statistics (STC1101)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe basic features of the data.	1
CO2	Summarize and interpret the data using different graphs.	2
CO3	Examine data and represent in the form of table and graph.	3
CO4	Analyze the data using different quantitative measures.	4
CO5	Compare different data sets and conclude the best fit.	5
CO6	Build predictive models for the data.	6
Title of the Course and Course Code	**Probability theory and discrete probability distributions (STC1102)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify and compare different probability distributions for different types of data.	1
CO2	Compute chance of an event based on prior knowledge of conditions related to that event.	2
CO3	Apply different forms of discrete probability distributions to the observed data.	3

CO4	Analyze the statistical measures used in various fields.	4
CO5	Conclude based on a pattern of observed data.	5
CO6	Develop analytical thinking for a problem or a solution from different points of view.	6
Title of the Course and Course Code	**Statistics Practical I (STC1103)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify the appropriate diagram for the given data.	1
CO2	Discuss various applications of statistical measures using R software.	2
CO3	Execute the computational techniques using R software.	3
CO4	Analyze different concepts of statistics using R software.	4
CO5	Validate the fundamental knowledge and represent using R software.	5
CO6	Write a program using R to build different regression models for the given data and estimate the error.	6
Title of the Course and Course Code	**Fundamentals of Logic Circuit Design (ELC1101)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify logic gates with symbols and truth tables. State Demorgan's theorems.	1
CO2	Discuss working of different logic circuits.	2
CO3	Apply the various rules and laws of Boolean Algebra for designing of digital circuits..	3
CO4	Analyze the arithmetic and logical circuits for specific applications.	4
CO5	Evaluate different logic gates using universal logic gates.	5
CO6	Construct different digital circuits using K-map.	6
Title of the Course and Course Code	**Sequential Logic Circuits (ELC1102)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe Flip flop, Counter, Shift register and various memory parameters.	1

CO2	Discuss construction, working of different sequential logic circuits and compare their advantages and disadvantages.	2
CO3	Use R-S, D, T flip flops for the design of counter, register and shift register circuits.	3
CO4	Analyze the elements of 4-bit shift register, counter ICs and block diagrams of memory expansion circuits.	4
CO5	Test working of shift registers, counters using truth tables, timing diagrams to examine the capacity of expanded memory.	5
CO6	Construct modulus counters, ring counters as per the requirement of the application.	6
Title of the Course and Course Code	**Electronics Practical 1 (ELC1103)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe the circuit diagrams using different symbols of electronic components.	1
CO2	Discuss working of circuits of individual experiment.	2
CO3	Apply DeMorgan's theorems, laws of Boolean algebra to construct different practical circuits.	3
CO4	Analyze observations of each experiment based on the aim and objectives of an experiment.	4
CO5	Evaluate observed outputs with expected theoretical outputs.	5
CO6	Reconstruct the given circuit to obtain electronic gadget.	6
Title of the Course and Course Code	**Discrete Mathematics (MTC1101)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe the basic concepts of sets, permutations, relations, graphs, trees and finite state machines.	1
CO2	Differentiate between disjunctive normal form and conjunctive normal form.	2
CO3	Apply the concepts of graphs to solve various problems in day to day life.	3
CO4	Analyze the basic structures of lattice and Boolean algebra.	4
CO5	Determine the concepts of various types of lattices.	5
CO6	Integrate ideas to find solutions to various recurrence relations.	6

Title of the Course and Course Code	Algebra (MTC1102)	Number of Credits : 02
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe basic concepts of Number Theory and various theorems.	1
CO2	Discuss groups and their types along with examples.	2
CO3	Apply various theorems to solve complicated problems.	3
CO4	Identify different types of group structure and apply them in Cryptography.	4
CO5	Determine parity check and generator matrix.	5
CO6	Compile the concepts, properties, aspects of Algebra and apply them in computer science.	6
Title of the Course and Course Code	**Mathematics Practical (MTC1103)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe basic commands of Scilab.	1
CO2	Explain various methods to find roots of Algebraic and Transcendental equations using Scilab.	2
CO3	Illustrate the concepts of recurrence relations.	3
CO4	Analyze different concepts of discrete mathematics and graph theory.	4
CO5	Determine parity check and generator matrix.	5
CO6	Build the necessary skill set and analytical abilities for writing computer based solutions using mathematical concepts.	6
F.Y. B.Sc. Semester II		
Title of the Course and Course Code	**Advance Programming using C (CSC1201)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define the basic concepts of C Programming to design more complex programs for solving problems.	1
CO2	Illustrate efficient memory handling techniques in programs with the concepts of pointers and dynamic memory management.	2
CO3	Implement various string and file handling functions.	3
CO4	Identify and organize data in structures and files to develop small applications.	4

CO5	Test and validate the data stored in the structures and files and perform various operations on it.	5
CO6	Design simple data processing applications for real-world problems. Develop the concepts for advanced programming like data structures and Object Oriented Programming.	6
Title of the Course and Course Code	**Relational Database Management System: (PL/SQL) (CSC1202)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Outline the fundamental concepts of relational database management systems.	1
CO2	Explain various methods of database security and access control techniques.	2
CO3	Illustrate the transaction management and recovery management techniques adopted in relational database management systems.	3
CO4	Differentiate between various types of databases.	4
CO5	Validate the queries by implementing error and exception handling techniques.	5
CO6	Write queries, functions, triggers, cursors and views using PL/SQL.	6
Title of the Course and Course Code	**Computer Science Practical – II (CSC1203)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify the concepts of programming in C language and RDBMS to design solutions for more complex problems.	1
CO2	Illustrate the use of advanced concepts of C programming and PL/SQL.	2
CO3	Execute the dynamic memory management techniques using the concept of pointers, string handling functions and structures in C Programming. Implement RDBMS concepts of nested queries, functions, cursors, triggers and views.	3
CO4	Explain pointers, structures, file handling in C programming and cursors, triggers and functions in PL/SQL.	4
CO5	Test and validate the outputs of the C programs and RDBMS queries.	5
CO6	Develop programs to design applications using advanced concepts of C programming and relational database concepts.	6

Title of the Course and Course Code	**Multiple regression, Time series and Simulation (STC1201)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify the skill set required for data analysis.	1
CO2	Explain and interpret different models of forecasting.	2
CO3	Apply appropriate simulation techniques to match simulated outcomes closely with real outcomes.	3
CO4	Analyze data related to time and predict its future behaviour.	4
CO5	Select the best prediction method in case of multivariate situations.	5
CO6	Build advanced predictive models.	6
Title of the Course and Course Code	**Continuous probability distributions and Inference (STC1202)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify the errors involved in using sample data for prediction.	1
CO2	Infer the reliability of hypothesis scientifically using different tests of hypothesis.	2
CO3	Apply different forms of continuous probability distributions.	3
CO4	Explain research questions using the sample data.	4
CO5	Test an assumption regarding population parameters using sample data.	5
CO6	Develop application of test procedures to different hypothesis problems.	6
Title of the Course and Course Code	**Statistics Practical II (STC1203)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify appropriate tests of hypotheses to the given data.	1
CO2	Discuss and implement various applications of statistical techniques using R.	2
CO3	Apply R software for validating the results.	3
CO4	Compare parametric and non-parametric tests of hypothesis.	4
CO5	Review an build statistical techniques using different computational methods.	5
CO6	Hypothesize real life problems and analyze them using appropriate inferential techniques.	6

Title of the Course and Course Code	Computer Instrumentation (ELC1201)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define sensor, its parameters and its applications.	1
CO2	Classify Sensors and discuss the need of signal conditioning circuits.	2
CO3	Use sensors, signal conditioning circuits, ADC and DAC in computer instrumentation.	3
CO4	Analyze signal conditioning circuits and different types of ADCs and DACs.	4
CO5	Compare the frequency response of different types of filters and discuss the need for selecting filters.	5
CO6	Construct a 3 stage instrumentation amplifier using OP-AMP. Design ADC or DAC with given specification.	6
Title of the Course and Course Code	Computer Organization (ELC1202)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe organization of Memory unit, I/O unit and register unit of digital system.	1
CO2	Discuss the construction and working of different processor architectures and architecture of 8086 Microprocessor.Discuss the use of various blocks in microprocessor architecture.	2
CO3	Classify the types of memory for fast and error free program execution.	3
CO4	Analyze features of serial communication, standard RS- 232 and UART.	4
CO5	Evaluate working of 8086 Microprocessor.	5
CO6	Construct DMA controller for fast transfer of data between I/O device and main memory.	6
Title of the Course and Course Code	Electronics Practical 2 (ELC1203)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify components of Motherboard.	1
CO2	Discuss the working of ADC, DAC and Filter circuits.	2
CO3	Carry out experiments by connecting power supply, input and	3

	output electronic sources.	
CO4	Analyze observations based on aim and objectives of an experiment.	4
CO5	Evaluate observed outputs with expected theoretical outputs.	5
CO6	Reconstruct the given circuit to obtain an electronic gadget.	6
Title of the Course and Course Code	**Graph Theory (MTC1201)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Recall the basic concepts of trees and graphs.	1
CO2	Explain various tree traversal algorithms.	2
CO3	Apply the concept of directed graphs to solve network flow problems.	3
CO4	Analyze different concepts of connected graphs.	4
CO5	Compare features of Hamiltonian and Eulerian graphs.	5
CO6	Develop real world problems using graph theory.	6
Title of the Course and Course Code	**Calculus (MTC1202)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Recall limits, continuity, derivatives of functions of a single variable and state mean value theorems.	1
CO2	Discuss the applications of various mean value theorems geometrically.	2
CO3	Apply Leibnitz theorem to find nth derivatives of product function and Taylor's theorem to find different power series.	3
CO4	Categorize different types of Indeterminate forms and find their solution.	4
CO5	Evaluate limits in indeterminate forms with the help of various methods.	5
CO6	Compile the concepts, properties, aspects of Calculus and apply them in computer science.	6
Title of the Course and Course Code	**Mathematics Practical II (MTC1203)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Recall the basics of mathematical concepts.	1
CO2	Extend the mathematical conceptual knowledge to	2

	programming.	
CO3	Implement different mathematical concepts.	3
CO4	Integrate the mathematical conceptual knowledge to write better programs.	4
CO5	Evaluate problems using various tools.	5
CO6	Write basic programs using Scilab.	6
	S.Y. B.Sc. Semester III	
Title of the Course and Course Code	**Data Structures and Algorithms – I (CSC2301)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify and define appropriate algorithms by developing problem solving skills by analysing a problem.	1
CO2	Discuss about different data structures and compare between primitive and non-primitive data structures.	2
CO3	Apply the various algorithms to solve real world computing problems.	3
CO4	Analyze the algorithms on the scale of their performance.	4
CO5	Test and perform critical evaluation of the program outcome to validate the correctness of the algorithm.	5
CO6	Integrate various concepts of algorithmic solutions and develop effective algorithms. Design different algorithms and compare their performance.	6
Title of the Course and Course Code	**Software Engineering (CSC2302)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define software and state its characteristics and features.	1
CO2	Illustrate the concepts of Object oriented approach towards software development.	2
CO3	Design and apply various software models to solve real world use cases of software projects.	3
CO4	Analyze the UML diagrams on the scale of their application in software development and classify various architectural designs of the project using various UML diagrams.	4
CO5	Test and perform critical evaluation of the software models and diagrams by applying them to various use cases of real world problems.	5
CO6	Integrate the concepts of developing software projects to meet the needs of the software industry.	6

Title of the Course and Course Code	**Computer Science Practical III (CSC2303)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe various concepts of different types of data structures. Define the concepts of effective software engineering practices, software modelling processes and Unified Modelling Language (UML).	1
CO2	Explain various techniques of data structures to give efficient solutions to the computing problems. Discuss software engineering principles and UML components.	2
CO3	Apply various searching, sorting algorithms to develop programs. Use software engineering practices for modelling of real word use cases using UML components.	3
CO4	Analyze and compare different searching, sorting techniques and different data structures to arrange data in memory. Classify different software modelling processes to decide the best process for the given requirements.	4
CO5	Test and perform efficient programs using various data structures. Evaluate real word use cases using software engineering principles and UML.	5
CO6	Write efficient programs by integrating various searching, sorting techniques and data structures. Integrate various components of UML to model any real word use case.	6
Title of the Course and Course Code	**Applied Algebra (MTC2301)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define linearly independent and dependent vectors.	1
CO2	Discuss the concepts of vector spaces and subspaces.	2
CO3	Apply concept of diagonalization (factorization) of a matrix using eigenvalues and eigenvectors.	3
CO4	Analyze norm, distance and angle between vectors to check similarities.	4
CO5	Determine eigenvalues and eigenvectors of a given matrix.	5

CO6	Generate matrix of a general linear transformation by evaluating kernel, range.	6
Title of the Course and Course Code	**Operations Research (MTC2302)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify the role of Linear programming problem solving skills in real life business models.	1
CO2	Distinguish between Transportation Problems and Assignment Problems.	2
CO3	Demonstrate methods including graphs and linear programming to analyze and solve the Two-person, zero-sum games.	3
CO4	Relate the theoretical problem solving techniques with their relative applications.	4
CO5	Validate and apply the techniques constructively to make effective business decisions.	5
CO6	Develop mathematical and computational modelling of real decision making problems.	6
Title of the Course and Course Code	**Mathematics Practical III (MTC2303)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Recall basic techniques, concepts of applied algebra and operations research.	1
CO2	Compute Eigenvalues and Eigenvectors.	2
CO3	Apply and test different mathematical concepts in python programming.	3
CO4	Integrate the mathematical conceptual knowledge to write better programs.	4
CO5	Discriminate different methods of assignment and transportation problems.	5
CO6	Write programs for different sorting algorithms.	6

Title of the Course and Course Code	**Microcontroller (ELC2301)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe features of 8051 Microcontroller architecture.	1
CO2	Differentiate between microprocessor and microcontroller.	2
CO3	Illustrate the programs to interface various devices with microcontrollers.	3
CO4	Classify instructions used in assembly language programming.	4
CO5	Determine the role of interrupts in microcontrollers.	5
CO6	Create different microcontroller based application interfaces.	6
Title of the Course and Course Code	**Microcontroller (ELC2302)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe elements, parameters of electronic communication system, Nyquist theorem and Shannon theorem.	1
CO2	Differentiate between Synchronous and Asynchronous communication. Compare different computer network models.	2
CO3	Apply digital modulation techniques for different applications.	3
CO4	Explain working of modulator and demodulator circuits using circuit / block diagrams.	4
CO5	Evaluate Multiplexing and Multiple access techniques.	5
CO6	Specify different digital communication systems for mobile application.	6
Title of the Course and Course Code	**Electronics Practical -III (ELC2303)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe instructions, syntaxes of assembly and embedded C	1

	language programs.	
CO2	Discuss modulation and multiplexing techniques required in communication systems.	2
CO3	Apply the knowledge to interface different input / output devices.	3
CO4	Analyze output using assembly or C language programs.	4
CO5	Test output of a circuit and compare with the expected output.	5
CO6	Construct application based circuits using microcontroller and other semiconductor devices.	6
S.Y. B.Sc. Semester IV		
Title of the Course and Course Code	**Data Structures and Algorithms –II (CSC2401)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Study different algorithms of non-linear data structures.	1
CO2	Illustrate various concepts for developing algorithmic solutions.	2
CO3	Apply various algorithms to solve real world computing problems.	3
CO4	Analyze the algorithms on the scale of their performance.	4
CO5	Test and implement critical evaluation of the program outcome to validate the correctness of the algorithm.	5
CO6	Develop problem solving skills by analysing a problem and by identifying and defining appropriate algorithms.	6
Title of the Course and Course Code	**Computer Networks (CSC2402)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define basic concepts of computer networks.	1
CO2	Explain networking models and addressing schemes.	2
CO3	Apply the topologies, encoding schemes and addressing methods as per given network environments.	3
CO4	Analyze the working of various layers of network models.	4
CO5	Compare various topologies, networking types and protocols.	5
CO6	Integrate the concepts of computer networking to design set up	6

	of network environments.	
Title of the Course and Course Code	**Computer Science Practical -IV (CSC2403)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	List the errors and warnings of programs based on non-linear data structures.	1
CO2	Represent various data structures for trees, graphs and hashing techniques.	2
CO3	Implement various shell interface commands by constructing and studying the Linux Environment.	3
CO4	Analyze the network behavior using the Wireshark tool.	4
CO5	Determine the implementation of user management on Linux based web browsers and different types of servers.	5
CO6	Write the program to simulate behavior of various non-linear data structures.	6
Title of the Course and Course Code	**Single Board Computer (ELC2401)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	List components on Raspberry Pi-3B+ model single board computer and its interfacing devices.	1
CO2	Discuss the Architecture of Raspberry Pi.	2
CO3	Demonstrate the use of Raspberry Pi in various applications.	3
CO4	Analyze and compile the Python programs to interface various devices with Raspberry Pi.	4
CO5	Determine the role of I/O, Time and Library functions.	5
CO6	Create different application based electronic systems using Raspberry pi.	6
Title of the Course and Course Code	**Wireless Communication (ELC2402)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe wired and wireless communication systems.	1
CO2	Discuss and summarize developments from 1G to 5G Cellular systems.	2
CO3	Apply the knowledge of different wireless systems to know the	3

	features of various technologies.	
CO4	Compare different generations of Cellular communication systems.	4
CO5	Evaluate GPS system and its features.	5
CO6	Design wireless smart home systems and smart irrigation systems.	6
Title of the Course and Course Code	**Electronics Practical – IV (ELC2403)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe I/O devices for interfacing Raspberry Pi.	1
CO2	Discuss GPRS and Zig bee systems for data transfer.	2
CO3	Applying concepts of interfacing I/O devices to Raspberry Pi by constructing circuits.	3
CO4	Analyze outputs using Python programs.	4
CO5	Compare observed outputs of an experimental circuit with the theoretically expected outputs.	5
CO6	Reconstruct the given experimental circuit to obtain a simple application circuit.	6
Title of the Course and Course Code	**Computational Geometry (MTC2401)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	State different types of projections on an object.	1
CO2	Compute points of standard curves using recursive formulae.	2
CO3	Demonstrate knowledge of key notions and principles related to 2 dimensional transformations.	3
CO4	Explain and implement the basic principles and theory of geometric algorithms.	4
CO5	Evaluate 3D transformations.	5
CO6	Construct Bezier curves of order 2 and order 3.	6
Title of the Course and Course Code	**Multivariable Calculus (MTC2402)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Recall series expansion of single variable functions.	1
CO2	Interpret the properties of continuous, derivable functions and	2

	mean value theorems.	
CO3	Apply concepts of double and triple integrals to solve various problems.	3
CO4	Explain higher order partial derivatives and their applications.	4
CO5	Evaluate limits of multi variable functions.	5
CO6	Create optimization algorithms using the gradient and extrema of multi variable functions.	6
Title of the Course and Course Code	**Mathematics Practical (MTC2403)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Recall 2 dimensional and 3 dimensional transformations.	1
CO2	Illustrate the concepts in the vector field.	2
CO3	Solve interpolation problems by writing python programs.	3
CO4	Analyze and implement all geometric algorithms.	4
CO5	Evaluate problems of differentiation, extrema of functions.	5
CO6	Generate equidistant points on the boundary of the standard circle/ellipse.	6
T.Y. B.Sc. Semester V		
Title of the Course and Course Code	**Operating System -I (CSC3501)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	List the elements of programming environment. Differentiate system programming and application programming.	1
CO2	Transform the algorithms into code to implement the various system programs.	2
CO3	Apply the knowledge of process concept and Linux system calls to implement a command interface (Shell).	3
CO4	Explain various system services and its examples, system calls and its types.	4
CO5	Compare computer system architectures. Discuss operating system operations.	5
CO6	Write assembly programs and explain the process of translation, execution.	6
Title of the Course and	**Fundamentals of Data Science - CSC3502**	**Number of Credits : 02**

Course Code		
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe data model and CRISP – DM.	1
CO2	Discuss various applications of data science.	2
CO3	Calculate statistical measures for the given dataset.	3
CO4	Identify methods for data preprocessing.	4
CO5	Determine the data visualization method to represent the data.	5
CO6	Collect data, apply data preprocessing, and visualize the data for the given case study.	6
Title of the Course and Course Code	**Java Programming –I - CSC3503**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	List the basics of object-oriented programming.	1
CO2	Illustrate the strong features of Java.	2
CO3	Implement file handling using different classes.	3
CO4	Classify different types of inheritance and exceptions.	4
CO5	Compare different Java libraries.	5
CO6	Design GUI based applications using swing and applet.	6
Title of the Course and Course Code	**Web Development - I (CSC3504)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe different web technologies and application development issues and trends.	1
CO2	Distinguish between server-side and client-side web technologies.	2
CO3	Apply CSS types for different web pages.	3
CO4	Explain different components and technologies of World Wide Web as a platform.	4
CO5	Validate web form fields using JavaScript.	5
CO6	Design and develop websites using fundamental web languages, technologies, and tools.	6
Title of the Course and Course Code	**Computer Networks- II - CSC3505**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive**

		level
CO1	Describe different protocols operating at transport and application layer.	1
CO2	Discuss network security concepts.	2
CO3	Solve problems based on cryptography.	3
CO4	Explain and determine different error detection and correction methods.	4
CO5	Compare TCP and UDP protocols.	5
CO6	Specify web architecture and HTTP.	6
Title of the Course and Course Code	**Theoretical Computer Science - CSC3506**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define basic concepts of automata theory and describe various forms of grammar to know functioning, capabilities and limitations of computers.	1
CO2	Explain and construct finite state systems and Context Free Grammar for the given language. Construct regular expressions to recognize patterns and PDA, Turing machine to recognize various computing languages or problems.	2
CO3	Apply various techniques and algorithms to transform computing models and grammar.	3
CO4	Analyze and simplify CFG, classify various grammars according to the Chomsky hierarchy.	4
CO5	Evaluate various classes of problems, grammar, languages, and language recognizer machines.	5
CO6	Integrate the concepts of finite automata, regular expression and context free grammar to create a LEX and YAAC programs. Create regular expression for regular languages to recognize patterns.	6
Title of the Course and Course Code	**Computer Science Practical – V - CSC3507**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	List the errors and warnings in an assembly program.	1
CO2	Explain and demonstrate the process of assembly program translation, execution, command line-interpreter (extended shell).	2
CO3	Apply different system calls for process creation, execution and its termination.	3
CO4	Identify and design various data structures and represent it in	4

	tabular format.	
CO5	Validate the input and execute the programs with test inputs.	5
CO6	Write modularized program code for implementing various System programs and integrate them.	6
Title of the Course and Course Code	**Computer Science Practical – VI - CSC3508**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	List different programming concepts to understand the designing of simple program.	1
CO2	Explain the importance of Object-oriented application design.	2
CO3	Implement the concept of interface and packages for real time application. Use HTML tags and CSS to design web page layout. Apply different styles to web pages.	3
CO4	Classify exceptions to handle run time errors and build the user defined exceptions.	4
CO5	Test and validate the JavaScript programs for given inputs.	5
CO6	Write programs using JavaScript. Develop user friendly applications based on MVC architecture.	6
Title of the Course and Course Code	**Computer Science Project – I - CSC3509**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define system scope and description.	1
CO2	Outline the data and functional requirement.	2
CO3	Demonstrate ER-Modelling.	3
CO4	Analyze classes and construct Class Diagram.	4
CO5	Select the technology for project.	5
CO6	Build the input / output screen.	6
Title of the Course and Course Code	**Software Testing and Automation Tools - CSC3511**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe the need of software testing and list different types of defects.	1
CO2	Discuss the basic concepts of testing techniques and illustrate various types of testing.	2
CO3	Apply software testing skills in different domains and develop	3

	test plans for evaluation.	
CO4	Detect the issues in software applications.	4
CO5	Select appropriate automation tool for testing and analyze its effectiveness.	5
CO6	Write the test cases to improvise the efficiency of the application.	6
Title of the Course and Course Code	**Python programming - CSC3512**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Recall the various basic programming concepts and apply them in Python programming.	1
CO2	Illustrate the various data structures in Python.	2
CO3	Use various GUI libraries to select and design GUIs for appropriate applications.	3
CO4	Explain various object-oriented features through Python.	4
CO5	Select and apply appropriate Python packages for Data Visualization to represent data in graphical format.	5
CO6	Write programs to handle data using the Pandas library.	6
	T.Y. B.Sc. Semester VI	
Title of the Course and Course Code	**Operating System –II - CSC3601**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe different concepts of operating system.	1
CO2	Discuss the concept of file systems and free space management.	2
CO3	Apply deadlock handling techniques to determine existence of deadlock and recover it.	3
CO4	Explain the concepts of memory management.	4
CO5	Compare and analyze the performance of different algorithms.	5
CO6	Write and implement different operating system related algorithms.	6
Title of the Course and Course Code	**Data Analytics - CSC3602**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define the key objectives of data analytics and describe its	1

	scope in different domains.	
CO2	Explain relationship between variables and synthesize the correlation between two quantitative variables using statistical terms.	2
CO3	Classify various machine learning techniques.	3
CO4	Integrate machine learning algorithms/techniques to construct use case-based models and achieve expected accuracy.	4
CO5	Evaluate performance of algorithms using evaluation.	5
CO6	Construct models using various algorithms.	6
Title of the Course and Course Code	**Java Programming -II - CSC3603**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Recall the object-oriented features to design platform independent applications.	1
CO2	Represent dynamic data structures using Collection Framework.	2
CO3	Implement game designing using multithreading concepts.	3
CO4	Identify the errors by testing the applications.	4
CO5	Decide the appropriate technology for designing web applications.	5
CO6	Integrate the concept of database and GUI to design user friendly applications.	6
Title of the Course and Course Code	**Web Development-II - CSC3604**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe concept of Object-Oriented Programming, file, and XML.	1
CO2	Represent AJAX model to develop interactive web pages.	2
CO3	Implement database connectivity and AJAX with PHP to generate dynamic and interactive web pages.	3
CO4	Distinguish PHP as a server-side programming language.	4
CO5	Determine how websites are built using various concepts and technologies.	5
CO6	Develop the modern web pages using the HTML, CSS features with different layouts and PHP as per need of applications.	6
Title of the Course and Course Code	**Design and Analysis of Algorithms - CSC3605**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's**

		Cognitive level
CO1	Identify the restrictions of the different algorithms techniques in terms of the key characteristics of problem solving.	1
CO2	Explain various advanced design and analysis techniques.	2
CO3	Solve the problem using Brute force techniques and integrate different solutions.	3
CO4	Classify tractable and intractable problems, p and np class problems and solve them using different design techniques.	4
CO5	Determine the strategy used to solve the problems that fits into various paradigms.	5
CO6	Devise efficient algorithms and analyze their performance measures.	6
Title of the Course and Course Code	**Artificial Intelligence - CSC3606**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe historical perspective, agents, branches, applications of Artificial Intelligence (AI).	1
CO2	Explain and evaluate search, control strategies and solve problems by applying a suitable search method.	2
CO3	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.	3
CO4	Analyze knowledge representation, predicate logic and simple game playing algorithms.	4
CO5	Evaluate various heuristic, planning, constraint satisfaction problems to select efficient strategy to solve AI problems.	5
CO6	Design and implement appropriate solutions for search problems, planning problems and write statements to transform into propositional and first order logic.	6
Title of the Course and Course Code	**Computer Science Practical -VII (CSC3607)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**

CO1	List the errors and warnings for the given input.	1
CO2	Transform the algorithms into program code and construct appropriate data structures.	2
CO3	Solve the problems based on each algorithm.	3
CO4	Explain and demonstrate execution process of the programs.	4
CO5	Validate the input and execute the programs with test inputs.	5
CO6	Write modularized program code for implementing various operating system algorithms and integrate them.	6
Title of the Course and Course Code	**Computer Science Practical -VIII - CSC3608**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define various dynamic data structures using Collection Framework in Java.	1
CO2	Articulate concept of database connectivity and executing database queries.	2
CO3	Demonstrate server side technology for development of web applications.	3
CO4	Structure and develop dynamic web pages using PHP, XML and AJAX.	4
CO5	Select appropriate technique and apply it to build game based applications.	5
CO6	Write programs to implement test and validate different concepts of Java and PHP programming.	6
Title of the Course and Course Code	**Computer Science Project-II - CSC3609**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define the activities involved in project.	1
CO2	Illustrate the different state of system.	2
CO3	Outline the test cases.	3
CO4	Structure the system using various UML diagrams.	4
CO5	Test and validate all inputs.	5
CO6	Develop project with code construction.	6
Title of the	**e-Commerce - CSC3611**	**Number of**

Course and Course Code		**Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe internet trading relationships.	1
CO2	Explain legal and privacy issues in e-Commerce.	2
CO3	Demonstrate the foundation and importance of e-commerce.	3
CO4	Analyze the impact of e-commerce on business models and strategy.	4
CO5	Compare the performance of electronic payment systems.	5
CO6	Integrate the key features of intranet, internet, extranet and explain how they relate to each other.	6

Title of the Course and Course Code	**User Interface Design - CSC3612**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Define principles of UI Design.	1
CO2	Explain the MVC (model-view-controller) design pattern.	2
CO3	Apply a user centered design in the creation of basic to complex software applications.	3
CO4	Explain how the observed problems can be resolved using principles of user interface design.	4
CO5	Compare between usability and user experience.	5
CO6	Design and develop user interfaces optimized for a range of devices and platforms.	6
Title of the Course and Course Code	**Computer Science Project - II (CSC3613)**	**Number of Credits : 02**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify problems in the existing system and describe the scope of system.	1
CO2	Predict data and functional requirements.	2
CO3	Organize the database with the required table and its fields.	3
CO4	Represent the system using various UML diagrams.	4
CO5	Test and validate the input data.	5
CO6	Develop project with code construction.	6