ST. JOSEPH'S COLLEGE (AUTONOMOUS), DEVAGIRI, CALICUT

FOR

DEGREE OF
BACHELOR OF SCIENCE (B.Sc.)
in
Computer Science & Mathematics
(Double Main)

(UNDER SJCBCSSUG 2019 SYSTEM)

Course Outcome
(2022 Admission Onwards)

COURSE OUTCOMES

Core Courses

SEMESTER I
GDCS1B01T: COMPUTER FUNDAMENTALS AND PROGRAMMING USING C

Contact Hours per Week : 4 (2L + 2P)
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Duration of External examination : 2 Hours

Course Outcomes

- Identifies basics of digital computing
- Develops an in depth understanding of functional and logical concepts of C Programming
- Provides exposure to problem solving through C programming

SEMESTER I
GDMA1B01T: CALCULUS

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- To show how these ideas of differential calculus can be applied in the problem of sketching of curves and in the solution of some optimization problems of interest in real life.
- To understand the geometric problem of finding out the area of a planar region and practical way of evaluating the definite integral which establishes the close connection between the two branches of Calculus.
- To find the arc length of a plane curve, volume, and surface areas of solids and so on.
- To use integration as a powerful tool in solving problems in physics, chemistry, biology, engineering, economics, and other fields.

SEMESTER I

GDMA1B02T: BASIC STATISTICS AND PROBABILITY

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Gives the students introductory level practical ability to choose, generate and properly interpret statistical data using descriptive measures
- Analyze statistical data using MS Excel.

SEMESTER II

GDCS2B02T: DATA STRUCTURES & OPERATING SYSTEMS

Contact Hours per Week : 4 (2T + 2 P)
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Understand basic data structures such as arrays, linked lists, stacks and queues.
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
- Students will learn the fundamental components of a computer operating system.
- Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms.
- Describe the role of paging, segmentation and virtual memory in operating systems

SEMESTER II

GDMA2B03T: MULTI VARIABLE AND VECTOR CALCULUS

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Learn the conceptual variations when advancing in calculus from one variable to multivariable discussion.
- Understand the maximization and minimization of multivariable functions subject to the given constraints on variables.
- Learn about inter-relationship amongst the line integral, double and triple integral formulations.
- Familiarize with Green's, Stokes' and Gauss divergence theorems.

SEMESTER III

GDCS3A01T: INTRODUCTION TO DATA SCIENCE

Contact Hours per Week : 4
Number of Credits : 4
Number of Contact Hours : 64 Hours
Course Evaluation : 100 Marks (Internal: 20 + External: 80)
Time of External examination : 2.5 Hours

Course Outcomes

- Understand the fundamental concepts of data science.
- Evaluate the data analysis techniques for applications handling large data and Demonstrate the data science process.
- Visualize and present the inference using various tools.
- Learn to think through the ethics surrounding privacy, data sharing.

SEMESTER III

GDMA3A01T: BASIC LOGIC, BOOLEAN ALGEBRA AND GRAPH THEORY

Contact Hours per Week : 5
Number of Credits : 4
Number of Contact Hours : 80 Hours
Course Evaluation : 100 Marks (Internal: 20 + External: 80)
Time of External examination : 2.5 Hours

Course Outcomes

- Identify correct and incorrect arguments
- Understand the criteria for the evaluation of arguments
- Understand the scientific way of decision making using the laws of logic
- Understand the concept of algebraic structures in Mathematics

- Identify a given algebraic structure as belonging to a particular family of structures and to state the characteristic properties of the members of the family
- Understand the concept of groups and derive basic theorems on groups
- Define the concept of Boolean algebra as an algebraic structure and list its properties
- Understand the applications of Boolean algebra in switching circuits
- Define a Graph and identify different classes of graphs
- Understand various applications of Graph theory

SEMESTER III

GDCS3B04T: DBMS & SOFTWARE ENGINEERING

Contact Hours per Week : 4 (2T + 2P)
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Students will have a broad understanding of database concepts and database management system software.
- Be able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
- Improve the database design by normalization and be able to write SQL/PL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
- Students will be able to decompose the given project in various phases of a lifecycle.

SEMESTER III

GDCS3B05T: THEORY OF COMPUTATION

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Examine the properties of formal language and automata, their equivalence and be familiar with Regular and Non regular Language and Finite automata.
- On successful completion of the course, the student will be familiar with Turing machines

- Understand the concept of Context Free Grammars and Pushdown Automata.
- Conversion techniques.
- Understand Tractable and Intractable Problems

SEMESTER III

GDMA3B05T: LPP AND APPLICATIONS

Contact Hours per Week : 4
Number of Credits : 4
Number of Contact Hours : 64 Hours
Course Evaluation : 100 Marks (Internal: 20 + External: 80)
Time of External examination : 2.5 Hours

Course Outcomes

- Study different methods to solve Linear Programming Problems.
- Study to convert real life problems as mathematical models
- Students experience the classical way of doing and enjoying mathematics in a much more logical way

SEMESTER III

GDMA3B04T: DISTRIBUTION THEORY AND STATISTICAL INFERENCE

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Ability to handle transformed random variables and derive associated distributions
- Knowledge of important continuous distributions such as Uniform, Normal, Exponential and Gamma and relations with some other distributions
- A fundamental understanding of Parametric models for developing relevant inferences on associated parameters, knowledge of point and interval estimation procedures and different methods of point estimation

SEMESTER IV

GDCS4A02T: JAVA PROGRAMMING

Contact Hours per Week : 7 (5L + 2P)
Number of Credits : 4
Number of Contact Hours : 112 Hours
Course Evaluation : 100 Marks (Internal: 20 + External: 80)
Time of External examination : 2.5 Hours

Course Outcomes

- Knowledge in OOP &basic concepts of Java Programming
- Develop reusable programs using the concepts of Inheritance, Polymorphism, Interfaces and packages.
- Apply the concepts of multithreading and exception handling to develop efficient and error free codes.
- Design event driven GUI and web related applications.

SEMESTER IV

GDMA4B07T: DIFFERENTIAL EQUATIONS

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
- Student will be able to find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.
- Student will be introduced to the complete solution of a nonhomogeneous differential equation with constant coefficients by the method of undetermined coefficients.
- Student will be able to find the complete solution of a differential equation with constant coefficients by variation of parameters.
- Student will have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients.

SEMESTER V

GDCS5B07T: DATA ANALYTICS USING PYTHON

Contact Hours per Week : 5 (3L + 2P)
Number of Credits : 3
Number of Contact Hours : 80 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Use advanced techniques to conduct thorough and insightful analysis, and interpret the results correctly with detailed and useful information.
- Show substantial understanding of the real problems; conduct deep data analytics using correct methods; and draw reasonable conclusions with sufficient explanation and elaboration.
- Write an insightful and well-organized report for a real-world case study, including thoughtful and convincing details.
- Make better business decisions by using advanced techniques in data analytics.

SEMESTER V

GDCS5B08T: COMPUTER NETWORKS AND MOBILE COMPUTING

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outline

- Understand the fundamental concepts of Computer Network.
- Familiarize with the basic taxonomy and terminology of Computer Network.
- Learn various Protocols used in Communication.
- Understand the basics of cryptography
- Learn the basics of Mobile computing.

SEMESTER V

GDCS5B09T: ARTIFICIAL INTELLIGENCE

Contact Hours per week : 3
Number of Credits : 2
Number of Contact Hours : 48 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Develop fundamental understanding of artificial intelligence (AI) and its foundations.
- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- Acquire the knowledge of real world Knowledge representation.

SEMESTER V

GDMA5B08T: REAL ANALYSIS

Contact Hours per Week : 5
Number of Credits : 4
Number of Contact Hours : 80 Hours
Course Evaluation : 100 Marks (Internal: 20 + External: 80)
Time of External examination : 2.5 Hours

Course Outcomes

- Describe fundamental properties of the real numbers that lead to the formal development of real analysis.
- Comprehend rigorous arguments developing the theory underpinning real analysis.
- Demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration.
- Construct rigorous mathematical proofs of basic results in real analysis.
- Appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.

SEMESTER V

GDMA5B09T: ALGEBRA

Contact Hours per Week : 5
Number of Credits : 4
Number of Contact Hours : 80 Hours
Course Evaluation : 100 Marks (Internal: 20 + External: 80)
Time of External examination : 2.5 Hours

Course Outcomes

- Demonstrate knowledge and understanding of topics including, but not limited to divisibility, prime numbers, congruences, quadratic reciprocity, Diophantine equations.
- Learn methods and techniques used in number theory.
- Understand the importance of algebraic properties with regard to working within various number systems
- Generate groups given specific conditions.

- Investigate symmetry using group theory

SEMESTER VI

GDCS6B10T: IMAGE PROCESSING

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- The ability to apply principles and techniques of digital image processing in applications related to digital imaging system design and analysis.
- The ability to analyze and implement image processing algorithms.
- To Gain hands-on experience in using software tools for processing digital images.

SEMESTER VI

GDCS6B11T: CLOUD COMPUTING

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Employ the concepts of storage virtualization, network virtualization and its management
- Apply the concept of virtualization in the cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Develop services using Cloud computing

SEMESTER VI

GDCS6B12P: PROGRAMMING LAB III: MATLAB & PYTHON

Contact Hours per Week : 3
Number of Credits : 3
Number of Contact Hours : 48 Hours
Course Evaluation : 100 Marks (Internal: 20 + External: 80)

Time of External examination : 2.5 Hours

Course Outcomes

- Knowledge in MATLAB
- Knowledge in Python

SEMESTER VI

GDMA6B10T: NUMERICAL ANALYSIS

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Understand the theoretical and practical aspects of the use of numerical analysis.
- Proficient in implementing numerical methods for a variety of multidisciplinary applications.
- Establish the limitations, advantages, and disadvantages of numerical analysis.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Understand of common numerical analysis and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.

SEMESTER VI

GDMA6B11T: LINEAR ALGEBRA

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)
Time of External examination : 2 Hours

Course Outcomes

- Identify and construct linear transformations of a matrix.
- Characterize linear transformations as onto, one-to-one.
- Solve linear systems represented as linear transforms.
- Express linear transforms in other forms, such as matrix equations, and vector equations.
- Characterize a set of vectors and linear systems using the concept of linear independence.

SEMESTER VI

GDCS6B13D & GDMA6B12D: INDUSTRIAL VISIT AND PROJECT WORK

Contact Hours per Week : 2 L
Number of Credits : 3
Number of Contact Hours : 32 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)

Course Outcomes

- Capability to acquire and apply principles of Software Engineering.
- Awareness about latest changes in technological world.
- Awareness about Global Industry.

Elective 1

GDMA6E01T: ADVANCED GRAPH THEORY

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Hours (Internal- 15 + External- 60)

Course Outcomes

- The students will be able to apply principles and concepts of graph theory in practical situations
- Able to understand the concept of colorings and theory.

Elective 2

GDMA6E02T: FUZZY MATHEMATICS

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)

Course Outcomes

- interpret fuzzy set theory and uncertainty concepts
- apply fuzzy set theory in modeling and analyzing uncertainty in a decision problem apply fuzzy control by examining simple control problem examples

Elective 3

GDMA6E03T: METRIC SPACES

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 64 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)

Course Outcomes

- Demonstrate an understanding of metric spaces by proving unseen results using the methods of the course.
- Correctly state the main definitions and theorems in the course.
- Produce examples and counterexamples illustrating the mathematical concepts presented in the course.
- Explain their reasoning about rigorous Analysis clearly and precisely, using appropriate technical language.

SEMESTER V
OPEN COURSE 1
(For students not having Mathematics as Core Course)

APPLIED CALCULUS

Contact Hours per Week : 4
Number of Credits : 3
Number of Contact Hours : 48 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)

Course Outcomes

- Students completing this course will be able to find a limit of a function graphically.
- Students completing this course will be able to compute the derivative of an algebraic function.
- Students completing this course will be able to find a (linear) Marginal Cost function and interpret it.
- Students completing this course will be able to find the area between two curves.

SEMESTER V
OPEN COURSE 2
(For students not having Mathematics as Core Course)

DISCRETE MATHEMATICS FOR BASIC AND APPLIEDSCIENCES

Contact Hours per Week : 3

Number of Credits : 3
Number of Contact Hours : 48 Hours
Course Evaluation : 75 Marks (Internal: 15 + External: 60)

Course Outcomes

- Analyze logical propositions via truth tables.
- Prove mathematical theorems using mathematical induction.
- Understand sets and perform operations and algebra on sets.
- Determine properties of relations, identify equivalence and partial order relations, sketch relations.
- Identify functions and determine their properties.
- Define graphs, digraphs and trees, and identify their main properties.
- Evaluate combinations and permutations on sets.

SEMESTER V
OPEN COURSE 3
(For students not having Mathematics as Core Course)

LINEAR MATHEMATICAL MODELS

Contact Hours per Week : 3
Number of Credits : 3
Number of Contact Hours : 48
Course Evaluation : 75 Marks (Internal: 15 + External: 60)

Course Outcomes

- the students will be able to Understand the idea of slope of the lines, understand to find solution of Linear Systems by the Echelon Method and Gauss Jordan method
- Gets an idea of matrices, understand how to add, subtract and multiplication of matrices and understand how find the inverse of a matrix
- Understand the methods of solving linear programming problems geometrically and understands the drawbacks of geometric methods and to solve LP problems more effectively using Simplex method
- Understand duality theory, a theory that establishes relationships between linear programming problems of maximization and minimization

SEMESTER V
OPEN COURSE 4
(For students not having Mathematics as Core Course)

MATHEMATICS FOR DECISION MAKING

Contact Hours per Week : 3

Number of Credits **: 3**
Number of Contact Hours **: 48 Hours**
Course Evaluation **: 75 Marks (Internal: 15 + External: 60)**

Course Outcomes

- The student could understand the classifications of data. Student is also introduced to various data collection techniques
- Student will learn to visualize various types of data with the use of frequency charts and appropriate graphs
- Student understands concepts like measures of central tendency, measures of variation and measures of position
- Student gets a clear understanding of basic probability concepts. Student learns conditional probability, addition rule and other basic theories in probability
- Student will learn various probability distributions of discrete and continuous variables
- Student learns about the normal distribution, which is an important continuous probability distribution in inferential statistics
- Student understands the standard normal distribution and learns the conversion of normal variable to standard normal variable