Government Arts College for Men (Autonomous)
Nandanam, Chennai - 600035
Department of Computer Science

GOVERNMENT ARTS COLLEGE
(Autonomous)
NANDANAM- CHENNAI – 600 035

B.Sc. DEGREE COURSE IN COMPUTER SCIENCE

(SEMESTER SYSTEM WITH CHOICE-BASED CREDIT SYSTEM)
(Effect from the Academic Year **2019 – 2020** and afterwards)

PROGRAM OUTCOMES, PROGRAM SPECIFIC OUTCOMES, COURSE OUTCOMES

Mechanism of Communication:

As per the UGC regulation and Accreditation learning outcomes of the Programs and Courses is stated below. The following mechanism is followed by the department to communicate the learning outcomes to the teachers and students.

- Hard Copy of syllabi and Learning Outcomes are available in the departments for ready reference to the teachers and students
- Learning Outcomes of the Programs and Courses are displayed in the department
- Soft Copy of Curriculum and Learning Outcomes of Programs and Courses are also available in online for reference
- The importance of the learning outcomes has been communicated to the teachers in every IQAC Meeting and College Committee Meeting.
- The students are also made aware of the same through Tutorial Meetings.

Department of Computer Science	
Programme Outcome	An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs. An ability to function effectively on teams to accomplish a common goal. An understanding of professional, ethical, legal, security and social issues and responsibilities. An ability to communicate effectively with a wide range of audiences. An ability to analyze the local and global impact of computing on individuals, organizations, and society. Recognition of the need for and an ability to engage in continuing professional development. An ability to use current techniques, skills, and tools necessary for computing practice. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices. An ability to apply design and development principles in the construction of software systems of varying complexity.

Programme Specific Outcome	Ability to apply the knowledge gained during the course of the program from Mathematics, Basic Computing, Basic Sciences and Social Sciences in general and all computer science courses in particular to identify, formulate and solve real life complex engineering problems faced in industries and/or during research work with due consideration for the public health and safety, in the context of cultural, societal, and environmental situations. Ability to provide socially acceptable technical solutions to complex computer science engineering problems with the application of modern and appropriate techniques for sustainable development relevant to professional engineering practice. Ability to apply the knowledge of ethical and management principles required to work in a team as well as to lead a team. Ability to comprehend and write effective project reports in multidisciplinary environment in the context of changing technologies.

Course Outcomes

Course	Outcomes
PYTHON PROGRAMMING	✓ To Study the Python programming language. ✓ This covers the programming language features in python and its important libraries. ✓ On completion of this course students will be able to develop any type of application using Python
PYTHON PROGRAMMING LAB	✓ Design real life situational problems and think creatively about solutions of them. ✓ Apply a solution clearly and accurately in a program using Python. ✓ Apply the best features of mathematics, engineering and natural sciences to program real life problems.
NUMERICAL METHODS	✓ Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems. ✓ Apply numerical methods to obtain approximate solutions to mathematical problems. ✓ 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
FUNDAMENTALS OF INFORMATION TECHNOLOGY	✓ Explain the social impact of information technology, both locally and globally, and the need for security, privacy and ethical implications in information systems usage ✓ Demonstrate problem-solving skills by identifying and resolving issues relating to information technology systems and their components ✓ Demonstrate the application of online collaboration and website development tools to support productivity and communication in

	business contexts ✓ Describe current information and communication, how they are selected, developed and used by organisations to produce goods and services, and to cooperate and/or compete with other organisations ✓ Demonstrate written communication skills by understanding basic information communication and technology (ICT) terminology for effective communication, and applying it within a business environment ✓ Collaborate as part of a team, and use online collaboration tools to plan and support their work.
E-COMMERCE AND ITS APPLICATION	✓ Understand the basic concepts and technologies used in the field of management information systems; ✓ Have the knowledge of the different types of management information systems; ✓ Understand the processes of developing and implementing information systems; ✓ Be aware of the ethical, social, and security issues of information systems;
DATA STRUCTURES AND ALGORITHM	✓ Student will be able to choose appropriate data structure as applied to specified problem definition ✓ Student will be able to handle operations like searching, insertion,deletion, traversing mechanism etc. on various data structures. ✓ Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc. Students will be able to use linear and nonlinear data structures like stacks, queues, linked list etc. ✓ Be able to design and analyze the time and space efficiency of the data structure. ✓ Be capable to identity the appropriate data structure for given problem ✓ Have practical knowledge on the application of data structures ✓ Define basic static and dynamic data structures and relevant standard algorithms for them: stack, queue, dynamically linked lists, trees, graphs, heap, priority queue, hash tables, sorting algorithms, min-max algorithm, ✓ Select basic data structures and algorithms for autonomous realization of simple programs or program parts ✓ Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

DATA STRUCTURES AND ALGORITHM LAB	✓ Choose appropriate data structure as applied to specified problem definition. ✓ Handle operations like searching, insertion, deletion, traversing mechanism on various data structures ✓ Have practical knowledge on the applications of data structures.Able to store, manipulate and arrange data in an efficient manner by implementing the algorithms by doing coding ✓ Able to implement queue and stack using arrays and linked list. ✓ Implementation of circular queue ,binary tree and binary search tree and the traversing through the binary tree are the other things to be done by them
GRAPH THEORY	✓ After completion of the course, the student will be able to: ✓ Explain the basic concepts of graph theory. ✓ Apply the basic concepts of mathematical logic describe and solve some real time problems using concepts of graph theory
OFFICE AUTOMATION	✓ To understand basic computer operations and the principal components of a computer and connected peripheral devices ✓ To understand and examine current operating systems, software utilities and application software ✓ To become proficient in using: -Windows -Word Processing Applications -Spreadsheet Applications -Presentation Graphics Applications ✓ To understand the basics of e-mail and newsgroups ✓ To introduce networking concepts including the Internet and its components and web browser basics.
PROGRAMMING AND PROBLEM SOLVING USING JAVA	✓ Have the ability to write a computer program to solve specified problems. ✓ Be able to use the Java SDK environment to create, debug and run simple Java programs. ✓ Be able to understand better the object-oriented approach in programming. Students should be able to analyze and design a computer program to solve real world problems based on object-oriented principles. ✓ Be able to write computer programs to solve real world problems in Java ✓ Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. ✓ To learn and appreciate the importance and merits of proper comments in source code and API documentations

COMPUTER ARCHITECTURE AND ORGANIZATION	✓ Describe the major components of a computer system and state their function and purpose ✓ Describe the microstructure of a processor ✓ Ability to know about memory. ✓ Describe how conventional machine instructions operate in conjunction with the components of a computer. ✓ Demonstrate the ability to program a microprocessor in assembly language. ✓ Classify and describe the operation of parallel computer architectures.
COMPUTER ARCHITECTURE AND ORGANIZATION LAB	✓ Implement the assembly language program like 8 bit addition, subtraction, division. ✓ Implement the block moving. ✓ Implementing ASCII to BCD ✓ Implementing
DISCRETE MATHEMATICAL STRUCTURES	Students will be able to: ✓ Write an argument using logical notation and determine if the argument is or is not valid. ✓ Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described. ✓ Understand the basic principles of sets and operations in sets. ✓ Prove basic set equalities. ✓ Apply counting principles to determine probabilities. ✓ Demonstrate an understanding of relations and functions and be able to determine their properties. ✓ Determine when a function is 1-1 and "onto". ✓ Demonstrate different traversal methods for trees and graphs. ✓ Model problems in Computer Science using graphs and trees.
PROGRAMMING IN JAVA	✓ Have the ability to write a computer program to solve specified problems. ✓ Be able to use the Java SDK environment to create, debug and run simple Java programs. ✓ Be able to understand better the object-oriented approach in programming. Students should be able to analyze and design a computer program to solve real world problems based on object-oriented principles. ✓ Be able to write computer programs to solve real world problems in Java ✓ Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. To learn and appreciate the importance and merits of proper comments in

	source code and API documentations ✓ Be able to write simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles.
PROGRAMMING IN JAVA LAB	✓ Students will get the knowledge of object oriented programming a the properties ✓ Students will get the knowledge of Difference between OOP and other conventional ✓ Students will get the knowledge of Basic concepts of object oriented programming using Java Implementation ✓ Students will get the knowledge of Class & Object proprieties and Basic concepts of java programming ✓ Students will get the knowledge of Reusability, Exception handling & Multithreading Students will get the knowledge of Applet Programming
STATISTICS USING R	✓ Understand the fundamental syntax of R through readings, practice exercises, demonstrations, and writing R code. ✓ Apply critical programming language concepts such as data types, iteration, control structures, functions, and boolean operators by writing R programs and through examples ✓ Import a variety of data formats into R using RStudio ✓ Prepare or tidy datas for in preparation for analysis ✓ Query data using SQL and R ✓ Analyze a data set in R and present findings using the appropriate R packages ✓ Visualize data attributes using ggplot2 and other R packages.
SOFTWARE ENGINEERING	✓ Able to understand the software engineering factors. ✓ Able to develop a solution strategy for planning the development process. ✓ Able to determine the cost estimation of software. ✓ Able to analyze the different software requirement specification techniques. ✓ Able to gain knowledge about the software design concepts. ✓ Able to design the real time and distributed system by using different plans. ✓ Able to analyze the problem of implementation issues. ✓ Able to understand the standards and guidelines. ✓ Able to identify the quality assurance of a developed software product. ✓ Able to evaluate the software system with various testing strategies.

OPERATING SYSTEMS	✓ Master functions, structures and history of operating systems ✓ Master understanding of design issues associated with operating systems ✓ Master various process management concepts including scheduling, synchronization, deadlocks ✓ Be familiar with multithreading ✓ Master concepts of memory management including virtual memory ✓ Master system resources sharing among the users ✓ Master issues related to file system interface and implementation, disk management ✓ Be familiar with protection and security mechanisms ✓ Be familiar with various types of operating systems including Unix
ADVANCE RELATIONAL DATABASE MANAGEMENT SYSTEMS	✓ To learn the basic concepts of DBMS ✓ To Know the concepts of SQL ✓ To understand PL/SQL, Triggers and cursors ✓ To know the concept of Normalization ✓ Define the terminology, features, classifications, and characteristics embodied in database systems. ✓ Master the basics of query evaluation techniques and query optimization. ✓ Master the basics of SQL and construct queries using SQL. ✓ Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database. ✓ Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
ADVANCE RELATIONAL DATABASE MANAGEMENT SYSTEMS LAB	✓ Construct problem definition statements for real life applications and implement a database for the same. ✓ Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra. ✓ Create and populate a RDBMS, using SQL. ✓ Write queries in SQL to retrieve any type of information from a data base. ✓ Analyze and apply concepts of normalization to design an optimal
GRID COMPUTING	✓ Able to appreciate the necessity of grid computing and thus its evaluation ✓ Able to understand where the grid computing could be effectively utilized by illustrations of applications of grid computing ✓ Able to select a proper technology and toolkit for using grid computing

GRAPHICS AND VISUALIZATION	✓ To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping. ✓ To describe the importance of viewing and projections. ✓ To define the fundamentals of animation, virtual reality and its related technologies. ✓ To understand a typical graphics pipeline 6. To design an application with the principles of virtual reality
WINDOWS PROGRAMMING	✓ Analyze program requirements ✓ Design/develop programs with GUI interfaces ✓ Code programs and develop interface using Visual Basic.Net ✓ Perform tests, resolve defects, and revise existing code
. NET PROGRAMMING	✓ Display proficiency in C# by building stand-alone applications in the .NET framework using C#. ✓ Create distributed data-driven applications using the .NET Framework, C#, SQL Server and ADO.NET ✓ Create web-based distributed applications using C#, ASP.NET, SQL Server and ADO.NET ✓ Utilize DirectX libraries in the .NET environment to implement 2D and 3D animations and game-related graphic displays and audio. ✓ Create a Web form with server controls. ✓ Separate page code from content by using code-behind pages, page controls, and components. ✓ Display dynamic data from a data source by using Microsoft ADO.NET and data binding. ✓ Debug ASP.NET pages by using trace.
. NET PROGRAMMING LAB	✓ Create Simple application using web controls ✓ Work with States of ASP.NET Pages & Adrotator Control ✓ Use of calendar control, Tree view control & Validation controls ✓ Query textbox and Displaying records & Display records by using database ✓ Data list link control & Data binding using drop down list control ✓ Inserting record into a database & Deleting record into a database ✓ Data binding using data list control & Data list control templates ✓ Data binding using data grid & Data grid control template ✓ Data grid hyperlink & Data grid button column Data list event & paging
DATA COMMUNICATION AND NETWORK	✓ Describe the evolution of data communication ✓ List and describe various data communication protocols of importance and networking standards ✓ Describe alternative networking approaches and topologies ✓ Describe various important hardware devices used in networking

	✓ Understand the role of commercial communications companies in networking ✓ Describe the tasks associated with maintaining network security ✓ Describe Wired and Wireless configurations and deployments ✓ Explain how communication works in data networks and the Internet. ✓ Recognize the different internetworking devices and their functions. ✓ Explain the role of protocols in networking. ✓ Analyze the services and features of the various layers of data networks. ✓ Design, calculate, and apply subnet masks and addresses to fulfill networking requirements. ✓ Analyze the features and operations of various application layer protocols such as Http, DNS, and SMTP.
ARTIFICIAL INTELLIGENCE	✓ Basic Knowledge about the concepts of Artificial Intelligence Production systems. ✓ Design and implement appropriate AI solution techniques for such problems. ✓ Ability to apply knowledge representation, reasoning, and machine learning techniques to real world problems. ✓ To Understand the Hill Climbing concepts and Best-First Search. ✓ Ability to learn Predicate logic and Representing Instance and relationships. ✓ To know the concept of Forward and Backward Reasoning. ✓ Introduction to Non Monotonic Reasoning and statistical reasoning. ✓ Implement appropriate learning algorithms such as decision trees, support vector machines, and boosting. ✓ To learn the concept of Neural Networks and Expert Systems ✓ To impart the basic idea about Knowledge acquisition. ✓ Machine
UNIX AND SHELL PROGRAMMING.	✓ An ability to understand the basic functioning of UNIX operating systems and shell programming. ✓ To analyze the buffers and kernel representation ✓ To understand the UNIX system structure, system calls. ✓ To understand UNIX segmentation, scheduling, paging
CLOUD COMPUTING	✓ Understand various basic concepts related to cloud computing technologies Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS ✓ Understand big data analysis tools and techniques Understand the

	underlying principle of cloud virtualization, cloud storage, data management and data visualization. ✓ Understand different cloud programming platforms and tools ✓ Be familiar with cloud programming using Google's 'Go' programming language ✓ Have details knowledge on reading and writing in cloud storage Be familiar with application development and deployment using cloud platforms ✓ Create application by utilizing cloud platforms such as Google app Engine and Amazon Web Services (AWS) ✓ Learn to develop scalable applications using AWS features. ✓ Learn basic concepts of Map Reduce programming models for big data analysis on cloud.
CRYPTOGRAPHY AND NETWORK SECURITY	✓ Identify some of the factors driving the need for network security ✓ Identify and classify particular examples of attacks ✓ Define the terms vulnerability, threat and attack ✓ Identify physical points of vulnerability in simple networks ✓ Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and explain the characteristics of hybrid systems. ✓ Identify computer and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks. ✓ Encrypt and decrypt messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms. ✓ Analyze existing authentication and key agreement protocols, identify the weaknesses of these protocols. (ABET Outcomes: c, e, k) ✓ Download and install an e-mail and file security software, PGP, and efficiently use the code to encrypt and sign messages. ✓ Develop SSL or Firewall based solutions against security threats, employ access control techniques to the existing computer platforms such as Unix and Windows NT. ✓ Write an extensive analysis report on any existing security product or code, investigate the strong and weak points of the product or code.

MOBILE COMPUTING	✓ An ability to function on multidisciplinary teams. ✓ A recognition of the need for, and an ability to engage in life-long learning. ✓ To impart fundamental concepts in the area of mobile computing. ✓ To provide a computer systems perspective on the converging areas of wireless networking, embedded systems, and software. ✓ To introduce selected topics of current research interest in the field. ✓ A working understanding of the characteristics and limitations of mobile hardware devices including their user-interface modalities. ✓ The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts. ✓ A comprehension and appreciation of the design and development of context aware solutions for mobile devices. ✓ An awareness of professional and ethical issues, in particular those relating to security and privacy of user data and user behavior
BIO INFORMATICS	✓ The students will be able to describe the contents and properties of the most important bioinformatics databases, perform text- and sequence-based searches, and analyze and discuss the results in light of molecular biological knowledge ✓ The students will be able to explain the major steps in pairwise and multiple sequence alignment, explain the principle for, and execute pairwise sequence alignment by dynamic programming ✓ The students will be able to predict the secondary and tertiary structures of protein sequences.