RAJA PEARY MOHAN COLLEGE

Department of Computer Science

Programe Specific Outcome, Course Outcome, Programe Outcome

DEPARTMENT OF COMPUTER SCIENCE

Raja Peary Mohan College
B.Sc. with Computer Science
Programme Outcome , Programme Specific Outcome and Course Outcomes(PO , PSO ,Cos)

Aims of Bachelor of Science Programmes in Computer Science

The Bachelor of Science degree in Computer Science emphasizes problem solving in the context of algorithm development and software implementation and prepares students for effectively using modern computer systems in various applications. The curriculum provides required computer science courses such as programming languages, data structures, computer architecture and organization, algorithms, database systems, operating systems, and software engineering; as well as elective courses in artificial intelligence, computer-based communication networks, distributed computing, information security, graphics, human-computer interaction, multimedia, scientific computing, web technology, and other current topics in computer science. The main aim of this Bachelor's degree is to deliver a modern curriculum that will equip graduates with strong theoretical and practical backgrounds to enable them to excel in the workplace and to be lifelong learners. The purpose of the BS programs in computer science are twofold: (1) to prepare the student for a position involving the design, development and implementation of computer software/hardware, and (2) to prepare the student for entry into a program of postgraduate study in computer science/engineering and related fields.

The Bachelor of Science program with Computer Science as one subject (BSc with CS) and the Bachelor of Science Honours programme in Computer Science (BSc(Hons) in CS) focus on the concepts and techniques used in the design and development of software systems. Students in this program explore the conceptual underpinnings of Computer Science -- its fundamental algorithms, programming languages, operating systems, and software engineering techniques. In addition, students choose from a rich set of electives that includes data science, computer graphics, artificial intelligence, database systems, computer architecture, and computer networks, among other topics. A generous allotment of free electives allows students to combine study in computer science with study in auxiliary fields to formulate a program that combines experiences across disciplines.

Programme Outcome:

The present Learning Outcome-based Curriculum Framework for bachelor's degrees in CS is intended to facilitate the students to achieve the following.

- To develop an understanding and knowledge of the basic theory of Computer Science and Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation.
- To develop the ability to use this knowledge to analyze new situations
- To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit to the above-mentioned purpose.
- The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems
- To learn skills and tools like mathematics, statistics, physics and electronics to find the solution, interpret the results and make predictions for the future developments.

The undergraduate program in Computer Science is presently being offered though the courses designed for granting the following degrees by various colleges and universities in India. All the courses are of 3-year duration spread over six semesters.

i. B.Sc (Honours) Computer Science

ii. B.Sc with Computer Science

B. Sc. with Computer Science

B.Sc. or Bachelor of Science with Computer Science is a general multidiscipline bachelor programme. The programme has a balanced emphasis on three science subjects, one of which is computer science. A student studying B.Sc. with Computer Science is required to choose two other subjects from a pool of subjects which include Physics, Mathematics, Statistics, Electronics, Chemistry. Different institutions offer different choice of combinations of subjects. Most popular combinations are Physics and Mathematics, Physics and Electronics, Mathematics and Electronics, but there are also combinations like Statistics and Economics or Commerce and Economics along with Computer Science.

1. Course Structures

Structure of B.Sc. with CS

The B.Sc. programme with CS as one of the subjects consists of 132 credits in accordance with the Choice Based Credit System (CBCS) approved by the UGC with 1 weekly -contact-hour for each credit for theory/tutorials and 2 weekly-contact-hours for each credit of laboratory work.

Credit-wise Distribution - Out of 132 credits, 108 credits are equally divided amongCS (denoted as A in the following table) and two other auxiliary subjects, denoted as B and C, (36 credits each). 36 credits for each subject are further distributed as 24 credits for Core Compulsory Courses (CC) and 12 credits for Discipline Specific Electives (DSE). There are 8 credits for Ability Enhancement Compulsory Courses. SEC's will have 16 credits.

Course-wise Distribution - There are 4 CC courses for each subject (CS and two auxiliary subjects). Each CC course is of 6 credits (4 Theory + 2 Practicum). Similarly, there are 2 DSE papers, each of 6 credits. There are 4 Skill Enhancement Courses (SEC) each of 4 credits with a total of 16 credits. 16 credits of SEC are distributed as 8 credits (2 courses) for subject A (CS) and 4 credits for each of two auxiliary subjects, subjects B and C (one courses for each subject). There are two AECC namely, Environ mental Sciences and Languages/ Communications with 4 credits.

Semester-wise Distribution – BSc with CS is a 3-Yr programme with 6 semesters. In each semester, there will be 22 credits. For each of first four semesters, there willbe 3 CC, one each for subjects A, B and C accounting to 18 credits. Similarly, for semesters 5 and 6, there will be 3 DSE in each semester and one DSE for each of three subjects (a, B and C). Two AECC will be offered in first two semesters. SEC will be offered in semesters 3, 4, 5 and 6 and a student is requiredto take any one SEC from a pool of options. However, in semesters 3 and 4, SEC for the auxiliary subjects will be offered and in semesters 5 and 6, SEC for CS will be offered.

The scope of the present proposal is to design CS courses. There are 4 CC courses for CS, 2 DSE courses and 2 SEC (CS related elective). A student can take more than 132 credits in total (but not more than 148 credits) to qualify for the grant of the B.Sc. (CS) degree after completing them successfully as per rules and regulations of the HEI.

Computer Science General (CMSG) Syllabus

Courses	Topics	Credit
CMS-G-CC-1-1-TH Sem-1-Core Course-1 Theory	Computer Fundamentals and Digital Logic Design	04
CMS-G-CC-1-1-P Sem-1-Core Course-1 Practical	Word Processing, Spreadsheet, Presentation and Web design by HTML	02
CMS-G-CC-2-2-TH Sem-2- Core Course-2 Theory	Algorithm and Data Structure	04
CMS-G-CC-2-2-P Sem-2-Core Course-2 Practical	Programming with C	02
CMS-G-CC-3-3-TH Sem-3- Core Course-3 Theory	Computer Organization	04
CMS-G-CC-3-3-P Sem-3-Core Course-3 Practical	Programming using PYTHON	02
CMS-G-CC-4-4-TH Sem-4- Core Course-4 Theory	Operating Systems	04
CMS-G-CC-4-4-P Sem-4-Core Course-4 Practical	Shell Programming (Linux)	02
Skill Enhancement Courses (SEC-A & B): Any one topic to be opted from SECA either in Semester-3 or in Semester-5. Any one topic to be opted from SECB either in Semester-4 or in Semester-6.		
CMS-G-SEC-A-X-1-TH	Communication, Computer Network and Internet	02
CMS-G-SEC-A-X-2-TH	Software Engineering	02
CMS-G-SEC-B-X-1-TH	Multimedia and its Applications	02
CMS-G-SEC-B-X-2-TH	Information Security	02
Discipline Specific Elective- A (DSE- A): Candidate has to opt any 2 of the following topics		
CMS-G-DSE-A-5-1-TH	Data base Management System (DBMS)	04
CMS-G-DSE-A-5-1-P	DBMS Lab using SQL	02
CMS-G-DSE-A-5-2-TH	Operation Research	04
CMS-G-DSE-A-5-2-P	Operation Research Lab using C	02
CMS-G-DSE-A-5-3-TH	Computer Graphics	04
CMS-G-DSE-A-5-3-P	Computer Graphics Lab using C	02
Discipline Specific Elective- B (DSE- B): Candidate has to opt any 2 of the following topics		
CMS-G-DSE-B-6-1-TH	Embedded Systems	04
CMS-G-DSE-B-6-1-P	Embedded Systems Lab.	02
CMS-G-DSE-A-6-2-TH	Object Oriented Programming	04
CMS-G-DSE-A-6-2-P	Object Oriented Programming by Java	02
CMS-G-DSE-A-6-3-TH	Computational Mathematics	04
CMS-G-DSE-A-6-3-P	Computational Mathematics Lab using C	02

Semester wise Course Outcomes in B.Sc with Computer Science

Semester –I

CMS-G-CC-1-1-TH: Computer Fundamentals and Digital Logic Design Core Course- 1: Theory: 60 Hours

General Concepts:

1. To make students understand the basic structure, operation and characteristics of digital computer.
2. To familiarize the students with arithmetic and logic unit as well as the concept of the concept of pipelining.
3. To familiarize the students with hierarchical memory system including cache memories and virtual memory.
4. To make students know the different ways of communicating with I/O devices and standard I/O interfaces.

CMS-G-CC-1-1-P: Word Processing, Spreadsheet, Presentation and Web design by HTML Core Course- 1: Practical: 40 Hours

General Concepts:

1. To understand basics of the Internet and World Wide Web
2. To acquire knowledge and skills for creation of web site considering both client and server-side programming
3. To learn basic skill to develop responsive web applications
4. To understand different web extensions and web services standards
5. To understand basic concepts of Search Engine Basics.
6. To learn Web Service Essentials.
7. To learn Rich Internet Application Technologies.

Semester –II

CMS-G-CC-2-2-TH: Algorithms & Data Structure

Core Course- 2: Theory: 60 hours

ALGORITHMS

1. To learn good principles of algorithm design;
2. To learn how to analyze algorithms and estimate their worst-case and average- case behavior (in easy cases);
3. To become familiar with fundamental data structures and with the manner in

which these data structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles;

4. To learn how to apply their theoretical knowledge in practice (via the practical component of the course).

DATA STRUCTURES

1. To be familiar with fundamental data structures and with the manner in which these data structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles
2. To have a knowledge of complexity of basic operations like insert, delete, search on these data structures.
3. Ability to choose a data structure to suitably model any data used in computer applications.
4. Design programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc.
5. Ability to assess efficiency tradeoffs among different data structure implementations.
6. Implement and know the applications of algorithms for sorting, pattern matching etc.

CMS-G-CC-2-2-P: Programming with C

Core Course- 2: Practical: 40 hours

Students are required to write and practically execute programs to solve problem using various data structures. The teacher can suitably device problems which help students experiment using the suitable data structures and operations.

Semester –III

CMS-G-CC-3-3-TH: Computer Organization

Core Course- 3: Theory:60 hours

1. To make students understand the basic structure, operation and characteristics of digital computer.
2. To familiarize the students with arithmetic and logic unit as well as the concept of the concept of pipelining.
3. To familiarize the students with hierarchical memory system including cache memories and virtual memory.
4. To make students know the different ways of communicating with I/O devices and standard I/O interfaces.

CMS-G-CC-3-3-P: Programming using Python

Core Course- 3: Practical: 40 hours

1. Develop and Execute simple Python programs.
2. Structure a Python program into functions.

3. Using Python lists, tuples to represent compound data
4. Develop Python Programs for file processing

Semester –IV

CMS-G-CC-4-4-TH: Operating Systems

Core Course- 4: Theory: 60 hours

OPERATING SYSTEM

1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.
2. To understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved over time.
3. Understanding of design issues associated with operating systems.
4. Understand various process management concepts including scheduling, synchronization, and deadlocks.
5. To have a basic knowledge about multithreading.
6. To understand concepts of memory management including virtual memory.
7. To understand issues related to file system interface and implementation, disk management.
8. To understand and identify potential threats to operating systems and the security features design to guard against them.
9. To have sound knowledge of various types of operating systems including Unix and Android.
10. Describe the functions of a contemporary operating system with respect to convenience, efficiency, and the ability to evolve.

CMS-G-CC-4-4-P: Shell Programming (Linux)

Core Course- 4: Practical: 40 hours

1. Learn to develop simple algorithms and flow charts to solve a problem.
2. Develop problem solving skills coupled with top down design principles.
3. Learn about the strategies of writing efficient and well-structured computer algorithms/programs.
4. Develop the skills for formulating iterative solutions to a problem.
5. Learn array processing algorithms coupled with iterative methods.
6. Learn text and string processing efficient algorithms.
7. Learn searching techniques and use of pointers.
8. Understand recursive techniques in programming.

Semester –III to VI

Skill Enhancement Courses (SEC-A & B): Choices : Semesters-3 to 6		
Courses	**Topics**	**Credit**
CMS-G-SEC-A-X-1-TH	Communication, Computer Network and Internet	02
CMS-G-SEC-A-X-2-TH	Software Engineering	02
CMS-G-SEC-B-X-1-TH	Multimedia and its Applications	02
CMS-G-SEC-B-X-2-TH	Information Security	02

CMS-G-SEC-A-X-1-TH: Communication, Computer Network and Internet Skill Enhancement

Course – A (SEC-A-1): Choice-1: Theory: 40 hours

1. Understand the structure of Data Communications System and its components. Be familiarize with different network terminologies.
2. Familiarize with contemporary issues in network technologies.
3. Know the layered model approach explained in OSI and TCP/IP network models
4. Identify different types of network devices and their functions within a network.
5. Learn basic routing mechanisms, IP addressing scheme and internetworking concepts.
6. Familiarize with IP and TCP Internet protocols.
7. To understand major concepts involved in design of WAN, LAN and wireless networks.
8. Learn basics of network configuration and maintenance.
9. Know the fundamentals of network security issues.

CMS-G-SEC-A-X-2-TH: Software Engineering

Skill Enhancement Course – A (SEC-A-2): Choice-2: Theory: 40 hours

1. Basic knowledge and understanding of the analysis and design of complex systems.
2. Ability to apply software engineering principles and techniques.
3. To produce efficient, reliable, robust and cost-effective software solutions.
4. Ability to work as an effective member or leader of software engineering teams.
5. To manage time, processes and resources effectively by prioritising competing demands to achieve personal and team goals Identify and analyzes the common threats in each domain.

CMS-G-SEC-B-X-1-TH: Multimedia and its Applications

Skill Enhancement Course – B (SEC-B-1): Choice-1: Theory: 40 hours

1. To familiarize the students with the image fundamentals and mathematical transforms necessary for image processing.
2. To make the students understand the image enhancement techniques
3. To make the students understand the image restoration and reconstruction procedures.
4. To familiarize the students with the image segmentation procedures.

CMS-G-SEC-B-X-2-TH: Information Security

Skill Enhancement Course – B (SEC-B-2): Choice-2: Theory: 40 hours

1. Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
2. Gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.
3. Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
4. Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.

Semester – V & VI

Discipline Specific Elective Courses (DSE-A & B): Choices: Semesters-5&6

Discipline Specific Elective- A (DSE- A): Candidate has to opt any 2 from the following topics		
CMS-G-DSE-A-5-1-TH	Data base Management System (DBMS)	04
CMS-G-DSE-A-5-1-P	DBMS Lab using SQL	02
CMS-G-DSE-A-5-2-TH	Operation Research	04
CMS-G-DSE-A-5-2-P	Operation Research Lab using C	02
CMS-G-DSE-A-5-3-TH	Computer Graphics	04
CMS-G-DSE-A-5-3-P	Computer Graphics Lab using C	02
Discipline Specific Elective- B (DSE- B): Candidate has to opt any 2 from the following topics		
CMS-G-DSE-B-6-1-TH	Embedded Systems	04
CMS-G-DSE-B-6-1-P	Embedded Systems Lab.	02
CMS-G-DSE-B-6-2-TH	Object Oriented Programming	04
CMS-G-DSE-B-6-2-P	Object Oriented Programming by Java	02
CMS-G-DSE-B-6-3-TH	Computational Mathematics	04
CMS-G-DSE-B-6-3-P	Computational Mathematics Lab using C	02

Semester – V

CMS-G-DSE-A-5-1-TH: Database Management System

Discipline Specific Elective Course – A (DSE-A-1): Choice-1: Theory: 60 hours

1. Gain knowledge of database systems and database management systems software.
2. Ability to model data in applications using conceptual modeling tools such as ER Diagrams and design data base schemas based on the model.
3. Formulate, using SQL, solutions to a broad range of query and data update problems.
4. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
5. Be acquainted with the basics of transaction processing and concurrency
6. Familiarity with database storage structures and access techniques.
7. Compare, contrast and analyze the various emerging technologies for database systems
8. Analyze strengths and weaknesses of the applications of database technologies to various subject areas.

CMS-G-DSE-A-5-1-P: DBMS Lab using SQL

Discipline Specific Elective Course – A (DSE-A-1): Choice-1: Practical: 40 hours

Students are required to practice the concepts learnt in the theory by designing and querying a database for a chosen organization (Like Library, Transport etc). The teacher may devise appropriate weekly lab assignments to help students practice the designing , querying a database in the context of example database.

CMS-G-DSE-A-5-2-TH: Operation Research

Discipline Specific Elective Course – A (DSE-A-2): Choice-2: Theory: 60 hours

1. Operations research (OR) is an analytical method of problem-solving and decision-making that is useful in the management of organizations. In operations research, problems are broken down into basic components and then solved in defined steps by mathematical analysis.
2. The process of operations research can be broadly broken down into the following steps:
3. Students have to Identify a problem that needs to be solved.
4. Constructing a model around the problem that resembles the real world and variables.]
5. Using the model to derive solutions to the problem.
6. Testing each solution on the model and analyzing its success.
7. Implementing the solution to the actual problem.

8. Operations research include statistical analysis, management science, game theory, optimization theory, artificial intelligence and network analysis. All of these techniques have the goal of solving complex problems and improving quantitative decisions.

CMS-G-DSE-A-5-2-P: Operation Research (O.R.) Lab. using C/ Python

Discipline Specific Elective Course – A (DSE-A-2): Choice-2: Practical: 40 hours

Students are required to practice the concepts learnt in the theory .

CMS-G-DSE-A-5-3-TH: Computer Graphics

Discipline Specific Elective Course – A (DSE-A-3): Choice-3: Theory: 60 hours

1. Acquire familiarity with the concepts and relevant mathematics of computer graphics.
2. Ability to implement various algorithms to scan, convert the basic geometrical primitives, transformations, area filling, clipping.
3. Describe the importance of viewing and projections.
4. Ability to design basic graphics application programs.
5. Familiarize with fundamentals of animation and Virtual reality technologies
6. Be able to design applications that display graphic images to given specifications.
7. To understand a typical graphics pipeline.

CMS-A-DSE-A-5-3-P: Computer Graphics Lab using C

DSE-A: Choice-3: Practical: 02 Credit: 40 hours

The students are required to create interactive graphics applications in C using graphics application programming interfaces and demonstrate geometrical transformations. The lab material includes implementation of line drawings, circle drawing, ellipse drawing as well as different geometrical transformations.

Semester –VI

CMS-G-DSE-B-6-1-TH: Embedded Systems

Discipline Specific Elective Course – B (DSE-B-1): Choice-1: Theory: 60 hours

1. Give the overview of Microcontroller 8051.
2. Give the overview of Microcontroller 8052
3. Give the overview of Microcontroller 8031

CMS-A-DSE-B-6-1-P:

Embedded Systems Lab.

CMS-A-DSE-B-6-1-P:

Embedded Systems Lab.

DSE-A: Choice-3:

Practical: 02 Credit: 40 hours

Students are required to practice the concepts learnt in the theory .

CMS-G-DSE-B-6-2-TH: Object Oriented Programming

Discipline Specific Elective Course – B (DSE-B-2): Choice-2: Theory: 60 hours

1. Learn the concepts of data, abstraction and encapsulation
2. Be able to write programs using classes and objects, packages.
3. Understand conceptually principles of Inheritance and Polymorphism andtheir use and program level implementation.
4. Learn exception and basic event handling mechanisms in a program
5. To learn typical object-oriented constructs of specific objectoriented pr

CMS-A-DSE-B-6-2-P: Object Oriented Programming by Java

DSE-B: Choice-2: Practical: 02

Credit: 40 hours

1. Knowledge of the structure and model of the Java programming language,
2. Use the Java programming language for various programming technologies
3. Develop software in the Java programming language,
4. Evaluate user requirements for software functionality required to decide whetherthe Java programming language can meet user requirements

CMS-G-DSE-B-6-3-TH: Computational Mathematics

Discipline Specific Elective Course – B (DSE-B-3): Choice-3: Theory: 60 hours

1. Understand the fundaments of procedural and functional programming;
2. Understand Matlab data types and structures;
3. Be able to set up simple real-life numerical problems such that they canbe solved and visualized using basic codes in Matlab;
4. Be ready to use advanced coding in Matlab in their

subsequent studies

CMS-G-DSE-B-6-3-P: Computational Mathematics Lab.

Discipline Specific Elective Course – B (DSE-B-3): Choice-3: Practical: 40 hours

Students are required to practice the concepts learnt in the theory .