PROGRAM OUTCOMES (PO)

PO1: Improve their computer literacy, their basic understanding of operative systems and a working. Develop criteria to organize and present different type of works in academic and professional environments.
PO2: Knowledge of software commonly used in academic and professional environments.
PO3: Learn how to organize information efficiently in the forms of outlines, charts, etc. by using appropriate software. Develop the skills to present ideas effectively and efficiently.
PO4: Do Academic and Professional Presentations - Designing and delivering an effective presentation and developing the various IT skills to the electronic databases.
PO5: Develop IT-oriented security issues and protocols. Design and implement a web page. Improve communication and business management skills, especially in providing technical support. Serve as the System Administrators with thorough knowledge of DBMS.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO1: Understand analyse and develop computer programs in the areas related to algorithms, web design, mobile application design.
PSO2: Apply standard software engineering process and strategies in software project development using open source programming environment to deliver a quality product for business success.
PSO3: To demonstrate advanced skills in the effective analysis design and realization of business system utilizing contemporary information technology.

COURSE OUTCOMES

COURSE NAME: Paper – I Introduction to Programming – C
CLASS - BCA **SEMESTER – I**

Objectives:

- The primary goal is to develop the programming skills in C.
- To get good knowledge of procedural language approach so that students can make software in the later stage of their course.
- This will help the students to frame the real world modeling of data and its associated functions
- This course also aims to an understanding of various concepts of C with the help of which one can create its own data types that can be used globally in different program files.

Outcomes:

a) Knowledge and Understanding: On successful completion of this subject the students have the programming ability in C Language.
b) Intellectual Cognitive/ Analytical Skills: Enhancing Logical Thinking and Reasoning Skills through Collaborative Learning in C Programming.
c) Practical Skills: Students would be capable of developing various applications to solve deluge of real world problems. They can also learn to make system software as well as application software. These existing languages could become base for developing new languages which can inherent its features. On the backend of various embedded systems, these languages are deployed.
d) Transferable Skills: In many multinational companies they can work effectively in a group or team to achieve goals and can show initiative and leadership abilities.

COURSE NAME: Paper – II Introduction to Computers and Information Technology
CLASS - BCA **SEMESTER – I**

Objectives of Course:

- Give students an in-depth understanding of why computers are essential components in business, education and society.
- Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.
- Provide hands-on use of Microsoft Office applications Word, Excel and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills.

COURSE OUTCOMES

At the end of this course the student shall be able to:

- Understand the basic terminology of computers
- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components
- Understand the difference between an operating system and an application program, and what each is used for in a computer
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products
- Identify the applications of computer in daily life
- Understand the practical concepts of MS Word , MS Excel and MS PowerPoint

COURSE NAME: Paper – III Applied & Discrete Mathematics
CLASS - BCA SEMESTER – I

- Simplify and evaluate basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic.
- Express a logic sentence in terms of predicates, quantifiers, and logical connectives
- Apply the operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion.
- Determine the domain and range of a discrete or non-discrete function, graph functions, identify one-to-one functions, perform the composition of functions, find and/or graph the inverse of a function, and apply the properties of functions to application problems.
- List the terms in a sequence, write a sequence in closed form, compute the sum of a finite sequence, compute the product of a finite sequence, and express sequences in terms of recursive or non-recursive forms.
- Perform basic matrix operations including sums, products, and transpose and perform 0-1 matrix operations.
- Apply rules of inference, tests for validity, and methods of proof including direct and indirect proof forms, proof by contradiction, proof by cases, and mathematical induction and write proofs using symbolic logic and Boolean Algebra.
- Solve counting problems by applying elementary counting techniques using the product and sum rules, permutations, combinations.
- Solve discrete probability problems and use sets to solve problems in combinatory and probability theory.
- Solve problems using recurrence relations and recursion to analyze algorithms and programs such as finding Fibonacci numbers and Tower of Hanoi problems.
- Solve problems using divide-and-conquer recurrence relations such as the fast multiplication algorithm and binary search.
- Describe binary relations between two sets; determine if a binary relation is reflexive, symmetric, or transitive or is an equivalence relation; combine relations using set operations and composition.
- Evaluate Boolean functions and simplify expression using the properties of Boolean algebra; apply Boolean algebra to circuits and gating networks.

Program Learning Outcomes:
Knowledge and Understanding:

- Students develop knowledge about basic matrix operations including sums, products, and transpose .
- Students develop knowledge about how to Simplify and evaluate basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic. , Express a logic sentence in terms of predicates, quantifiers, and logical connectives
- Students learn to apply the operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion.
- Determine the domain and range of a discrete or non-discrete function, graph functions.

COURSE NAME: Paper – I Introduction to Programming – C ++
CLASS - BCA SEMESTER – II

Objectives of the Course:

- To take review or tour of Programming in C and make aware of limitation of C, thereby need of the origin of C++.
- To impart knowledge in such a way that students should be able to use of concept of Object Oriented Programming Approach in their programming skills.
- To imbibe with the knowledge of implementation of various features of C++ i.e. concept of Object, Object communication, Encapsulation, Data hiding, overloading, inheritance, polymorphism etc.
- To raise programming level of students in C++ to be able to apply in the real life.

Program Learning Outcomes:

(Knowledge and Understanding, Intellectual Skills, practical Skills, Transferable skills).

Learning Outcomes:

A. Knowledge and Understanding:

Students will be

- Able to know how to do programming in C++ environment.
- Able to understand and implement the concepts of object oriented approach using C++.
- Able to acquire in depth knowledge and develop software in C++

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to

- identify different class attributes, member functions, base class and derived class and their relationships among them
- learn how to reuse the code using polymorphism

C. Practical Skills

Students will be able to learn:

- to solve a real life existing problems using the features of C++
- to develop software/ big and complex programs for a complex problems
- implement advance features of object oriented approach in other various language(s).

D. Transferable Skills :

Students will be able to

- use C++ more effectively,
- learn to think more analogously, creatively as well as comparatively
- Develop better software development skills in other language too.

COURSE NAME: Paper – II Principles of Digital Electronics
CLASS - BCA SEMESTER – II

Objectives of the Course :

This course is aimed at acquainting students with the principles of digital electronics. The course aims to equip students with the basic building blocks of all digital circuits laying more emphasis

on logic gates, combinational circuits and sequential circuits. The course also aims to impart fundamental knowledge about construction of computer memory.

Program Learning Outcomes:

Students will learn how to :

- Convert numbers from one number system to another.
- Represent information using Binary Codes.
- Draw Logic circuit Diagrams and write Truth Tables for the functions.
- Solve and minimize expressions of Boolean Algebra.
- Draw Combinational Circuits and Sequential Circuits.
- Perform address selection in semiconductor memory chips

COURSE NAME: Paper – III Numerical Methods & Statistical Techniques
CLASS - BCA SEMESTER – II

Objectives of the Course:

The objectives of the course are to develop numerical methods aided by technology to solve algebraic, transcendental, and differential equations, and to calculate derivatives and integrals. The course will also develop an understanding of the elements of error analysis for numerical methods and certain proofs.

Program Learning Outcomes:

- Develop appropriate numerical methods to approximate a function
- Perform an error analysis for various numerical methods
- Develop appropriate numerical methods to solve a differential equation
- Derive appropriate numerical methods to solve a linear system of equations
- Derive appropriate numerical methods to evaluate a derivative at a value
- Prove results for various numerical root finding methods
- Derive appropriate numerical methods to calculate a definite integral
- Code various numerical methods in a modern computer language

COURSE NAME: Paper–I Computer Architecture
CLASS - BCA SEMESTER – III

Objectives of the Course:

This course is about the principles of computer design; instruction set design concepts, performance enhancements, new and alternative computer architectures, and the design and implementation of high performance computing systems. To study the basic organization and architecture of digital computers (CPU, memory, I/O, software). Discussions will include digital logic and microprogramming. Such knowledge leads to better understanding and utilization of digital computers, and can be used in the design and application of computer systems or as foundation for more advanced computer-related studies.

Program Learning Outcomes:

Knowledge and Understanding:

- Students will know what are registers, various types of registers and interfacing various registers.
- Students will learn about the architecture of common bus system.
- Students will learn about the different micro-operations used.
- Students will learn about Design of basic computer.
- Students will learn about Instruction Cycle, Interrupt Cycle.
- Students will understand about various kinds of memories used, memory hierarchy.
- Students will learn about I/O interface, DMA controller, modes of data transfer.
- Students will learn about difference between pipeline and vector processing.

COURSE NAME: Paper–II Database Management System
CLASS - BCA **SEMESTER – III**
Objective of the course:

It aims at acquainting students better with the basics of DBMS, different Architectural Models for DBMS, Normalization of data, Concurrency control problems and its management, Protection, Security and recovery aspects of databases along with practical knowledges of databases using SQL and PL/SQL. Career prospectus after completion of course of study are as Data manager, Data administrator, Database analyst, Database designer and allied jobs. Further Knowledge of database management systems software and strong programming skills are essential for achieving heights in this field.

- The key goal is to prepare students for a professional career in the field of data administration and database design.
- To get acquaint students with good knowledge of DBMS. During the course, students will learn about database design and database handling activities.
- To get acquaint students with basics of database security and administration.

Course Outcomes:

- a) Knowledge & Understanding : Databases and their design & development
- b) Intellectual Cognitive/ analytical skills: Normalization of Databases.
- c) Practical Skills :Using SQL and PL/SQL.
- d) Transferable skills: Usage of DBMS design and administration.

COURSE NAME: Paper–III Computational Problem Solving Using Python
CLASS - BCA **SEMESTER – III**

Objective of the course:

It aims at acquainting students better with the process of Computational Problem Solving, Python Programming Language fundamentals. Students will enrich their programming skills using Data types, List Structures, Control Structures, Functions, Objects and their Use, Modular Design and Text files handling using Python Language. Python is a very powerful language and is used in various domains so there is better career prospectus for the students after grasping thorough knowledge about Python programming. Career prospectus after completion of course of study are as Programmer, Web developer, Data Scientist, Information Officer, Application analyst, IT consultant, IT technical support officer and allied jobs. Further Knowledge of usage of Python libraries and other allied technical skills are essential for achieving heights in this field.

The key goal is to prepare students for a professional career in the field of Programing, Web development, Data Science etc.

- To get acquaint students with good knowledge of Programming skills.
- To get acquaint students with various case studies using Python.

Course Outcomes:

a) Knowledge & Understanding : Python programming.

b) Intellectual Cognitive/ analytical skills: Application development.

c) Practical Skills :Programming for application development and data science.

d) Transferable skills: Ability to define a practical problem, Data structure and Modular approach.

COURSE NAME: Paper – I Data Structure & File Processing
CLASS - BCA **SEMESTER – IV**

Objective of the course:
1. To impart the basic concepts of data structures and algorithms
2. To teach efficient storage mechanisms of data for an easy access.
3. To design and implementation of various basic and advanced data structures.
4. To introduce various techniques for representation of the data in the real world.
5. To improve the logical ability

Learning Outcomes:

A. **Knowledge and Understanding:**

1. 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.
2. Demonstrate advantages and disadvantages of specific algorithms and data structures,
3. Select basic data structures and algorithms for autonomous realization of simple programs or program parts
4. Determine and demonstrate bugs in program, recognize needed basic operations with data structures
5. Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures,
6. Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

B. Intellectual Skills:

1. Ability to define the computer science problems.
2. Ability to drive different solution alternatives for the computer science problems.
3. Ability to analyze the solution alternatives and choose the optimum one

C. Practical Skills:

Design, build and develop programs of varying levels of complexity.

D. **Transferable Skills:**

Knowledge of the concepts and material presented in this course will provide the students with the capability to:

1. Use data structures effectively to solve practical problems.
2. Write and present effective computer programs that employ efficient algorithms.
3. Work in stressful environment and within constraints.
4. Search for information and adopt life-long self-learning.

COURSE NAME: Paper – II Information Systems
CLASS - BCA **SEMESTER – IV**

Objective of the course:

It aims at acquainting students better with the essentials of Information, system and management. It encompasses study of Information Systems (IS), its functions, types and categories, various case studies of IS, Technologies for IS, Milestones in Hardware and Software and SDLC mainly. Career prospectus after completion of course of study are as Data and Information manager, Data administrator, Data analyst, Information Officer, Application analyst, IT consultant, IT technical support officerand allied jobs. Further Knowledge of Information management systems software and strong programming skills are essential for achieving heights in this field.

The key goal is to prepare students for a professional career in the field of data administration Data analysis, as Information Officer, Application analyst etc.

- To get acquaint students with good knowledge of of Information, system and management essentials. It also encompasses study of Information Systems (IS), its functions, types and categories.
- To get acquaint students with various case studies of IS, Technologies for IS, Milestones in Hardware and Software and System development life cycle aspects.

Course Outcomes:

- Knowledge & Understanding : Software Development Life Cycle (SDLC) Development
- Intellectual Cognitive/ analytical skills: System Analysis and Design
- Practical Skills : System Design Tools
- Transferable skills: Software requirement specification, S/W Design Tools, SDLC skills

COURSE NAME: Paper – III Internet Applications
CLASS - BCA **SEMESTER – IV**
Objectives:

- The primary goal is to prepare students for full knowelege of internet its application and working of Internet
- To get good knowledge of internet protocol,working of all protocols
- Also you can learn how to design web pages in HTML practically.

Program Learning Outcomes:

(Knowledge and Understanding, Intellectual Skills, practical Skills, Transferable skills).

A. Knowledge and Understanding):

Students will

- know how to define internet, www, various protocols
- understand the working of internet
- are able to create email id and use it for sending online mails and attachments
- Students will understand and be able to describe the differences between internet and intranet.

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to

- identify which medium and topology should be used for networking
- They will be able to judge which connection should they use for getting an internet at home or work.
- Browsing at high sped using keywords

C. Practical Skills

Students will learn to:

- Able to create HTML based web pages
- Dynamicity to web page using javascript.
- Create email ids
- Surf net using shortcuts.

D. Transferable Skills :

Students will be able to

- Create projects and earn money by selling them

COURSE NAME: Paper – IV System Software

CLASS - BCA SEMESTER – IV

Objectives of the Course:

Main objective is to learn the system software. What are the different types of system software used in a computer. Distinguish between system and application softwares and their characteristics. Understanding the roles of various system softwares.

Learning Outcomes

Upon completion, graduates with a BS degree in Software Development should be able to:

- Examine computer users' needs in order to design, construct, test and maintain computer application software or systems.
- Apply relevant methods to assess the important application development and deployment challenges involved in adopting various cloud architectures.
- Create software and web applications that are intuitive for use by a wide range of users.
- Lead and participate effectively in teams in the software development process.
- Use appropriate resources to stay abreast of the latest industry development tools and techniques.

COURSE NAME: Paper – I Computer Networks

CLASS - BCA SEMESTER – V

Objectives of the Course:

This course aims to an understanding of communication of data, transmission of data signals, network security and privacy, various multiplexing and switching elements. This course also aims to an understanding of various models used in networking and how to secure data using cryptography.

Program Learning Outcomes:

Knowledge and Understanding:

- Students will know what is network, its types.
- Students will learn about the different topologies used in network.
- Students will understand different protocols used in internet.
- Students will understand and be able to describe the differences between intranet, extranet and internet.
- Students will understand about various multiplexing and switching techniques used in networks.

Students will learn about various services provided by network.

COURSE NAME: Paper – II Web Technologies
CLASS - BCA **SEMESTER – V**

Objectives of the Course:

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using java technologies. Students will gain the skills and project-based experience needed for entry into web application and development careers.

Student Learning Outcomes:

Upon successful completion of this course, candidates will be able to:

- Outline the history of the web, and technologies that makes the web pages and publishing them.
- Make the web pages more dynamic and interactive.
- Design to create structure of web page, to store the data in web document, and transport information through web. Design to be reusable the software components in a variety of different environments.
- Install Tomcat Server and execution of programs on server side.
- Identify the problems in Servlets and overcome those using Java Server Pages also develop JSP applications with Model View Control architecture.
- Establish the Connection between Java Application and database) to insert, retrieve and modify the data in tables.
- Design a dynamic web application using PHP

COURSE NAME: Paper – III Operating System
CLASS - BCA **SEMESTER – V**

Objectives of the Course:

- To understand the main components of an OS & their functions
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.
- To understand the concepts and implementation Memory management policies and virtual Memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies

Student Learning Outcomes:

- Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- Understand the process management policies and scheduling of processes by CPU
- 3. Evaluate the requirement for process synchronization and coordination handled by operating system
- 4. Describe and analyze the memory management and its allocation policies.
- 5. Identify use and evaluate the storage management policies with respect to different storage management technologies.
- Identify the need to create the special purpose operating system

COURSE NAME: Paper – IV JAVA Programming Language
CLASS - BCA **SEMESTER – V**
Objectives of the Course:
Students will get familiar with

- Object-oriented programming: data abstraction, encapsulation, classes, objects, templates, operator overloading, function overloading, inheritance, polymorphism, exception handling, and streams.
- The principles of inheritance, interface and packages and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
- To understand importance of Multi-threading & different exception handling mechanisms.

Program Learning Outcomes:

(Knowledge and Understanding, Intellectual Skills, practical Skills, Transferable skills).

B. Knowledge and Understanding):
Students will

- Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
- Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem

B. Intellectual(Cognitive/ Analytical) Skills:
Students will be able to

- Evaluate how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
- understand and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.

C. Practical Skills

Students will be able to

- Design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
- Understand the importance of Classes & objects and will be able to implement it along with constructors, Arrays and Vectors.
- Develop computer-based systems.
- Deploy the tools for software projects documentation.

D. Transferable Skills :

Students will be able to

- Practice Designing skills in software projects.
- Practice Engineering skills for software development.

COURSE NAME: Paper – I Computer Graphics

CLASS - BCA **SEMESTER – VI**

Objectives of the Course:

- Virtual Reality of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
- To learn the basic principles of 3- dimensional computer graphics.
- Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
- Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.
- To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.
- To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and applications.

Program Learning Outcomes:

Knowledge and Understanding:

- To list the basic concepts used in computer graphics.
- 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
- To design an application with the principles of virtual reality

COURSE NAME: Paper – II Software Engineering
CLASS - BCA **SEMESTER – VI**

Objectives of the Course:

- This course introduces the concepts and methods required for the construction of large software intensive systems. It aims to develop a broad understanding of the discipline of software engineering.
- It seeks to complement this with a detailed knowledge of techniques for the analysis and design of complex software intensive systems. It aims to set these techniques in an appropriate engineering and management context.
- It provides a brief account of associated professional and legal issues

Program Learning Outcomes:

(Knowledge and Understanding, Intellectual Skills, practical Skills, Transferable skills).

Learning Outcomes:

After completing the course attendees will able to:

- Understanding the issues affecting the organisation , planning, control of software-based systems development.
- Complete the analysis and design of software intensive systems.
- Read and understand the professional and technical literature on software engineering.