B.Tech. / B.Tech. (Honors) Computer Science & Engineering

Program Objectives:

A graduate of the Computer Science and Engineering Program should:

a. Students will establish themselves as effective professionals by solving real problems through the use of computer science knowledge and with attention to team work, effective communication, critical thinking and problem solving skills.

b. Students will develop professional skills that prepare them for immediate employment and for life-long learning in advanced areas of computer science and related fields.

Program Outcomes:

A graduate of the Computer Science and Engineering Program will demonstrate:

a. An ability to apply knowledge of computing, mathematical foundations, algorithmic principles, and computer science and engineering theory in the modeling and design of computer-based systems to real-world problems **(fundamental engineering analysis skills).**

b. An ability to design and conduct experiments, as well as to analyze and interpret data **(information retrieval skills).**

c. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability, and sustainability **(creative skills).**

d. An ability to function effectively on multi-disciplinary teams **(teamwork).**

e. An ability to analyze a problem, and identify, formulate and use the appropriate computing and engineering requirements for obtaining its solution **(engineering problem solving skills).**

Course Code: CSL0101/CSL0201

Course Name: Essentials of Information Technology   **Semester-I**

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
03	2	0	2	04	06	B. Tech. (All)

Objective(s): This course aims to teach students:

- Basics of computer system with various hardware/software components;
- Basics of computer networks, operating system and Internet with their applications;
- Basics of website designing;
- Using MS Office (MS Word, MS Excel, MS PowerPoint);
- Basics of computer programming language (C Programming).

Course Outcomes: After successful completion of this course, students would be able to:

- familiar with fundamentals of computer systems with various hardware/software components;
- understand operating systems, computer networks, and Internet;
- have a practical experience of website designing;
- have practical experience of computer programming; have practical experience of MS Office package.

Course Code: CSP0101

Course Name: Programming Logics   **Semester:** I

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
3	0	0	6	06	02	B. Tech. (CS)

Objective(s): This course aims to introduce students with 'C' programming language.

Course Outcomes: After successful completion of this workshop, students would be able to:

- familiar with programming concepts;
- have a practical experience of computer programming;
- write programs for real life problems;
- Learn other higher level programming languages easily.
- Validate the program for all the possible inputs.

Course Code: CSL0202

Course Name: Web Architecture and Design   **Semester:** II

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
02	0	0	4	02	02	B. Tech. (CSE)

Objective(s): To introduce students the detailed description about web page, web site planning, management and maintenance. The main aim of the subject is to understand the concepts of (a) HTML and HTML5, (b) XML, (c) CSS, and (d) JavaScript.

Course Outcomes: After successful completion of this course, students would be able to understand:

- HTML and CSS;
- JavaScript and XML.

Course Code: CSP0203

Course Name: Object Oriented Programming with C++   **Semester:** II

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
03	0	0	6	06	10	B. Tech. (CS)

Objective(s): The aim of teaching this course is that students should have conceptual and practical knowledge of object oriented methodology with practical implementation in C++.

Course Outcomes: After successful completion of this course, students would be able to:
- understand various concepts of object oriented programming;
- have a practical experience of computer programming;
- write programs for real life problems;
- learn other (object oriented) programming languages easily.

Course Code: CSL0357

Course Name: Data Structures   **Semester:** III

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): This course aims to teach students:
- familiar with major data structures;
- determine which data structure to use in different scenarios;
- demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs;
- demonstrate understanding of various sorting techniques, including bubble sort, heap sort and quick sort;
- demonstrate understand understanding of various graph and tree traversal approaches;
- demonstrate understanding of various searching techniques;
- program multiple file programs in a manner that allows for reusability of code;
- compare different implementations of data structures and to recognize the advantages and disadvantages of the different implementations;
- trace and code recursive functions;
- implement various data structures in more than one manner;
- Write complex applications using structured programming methods.

Course Outcomes: After successful completion of this course, students would be able to:
- have a comprehensive knowledge of the data structures;
- understand the importance of data and be able to identify the data requirements for an application;
- have a practical experience of algorithmic design and implementation;
- have practical experience of developing applications that utilize data structures;
- Develop projects requiring the implementation of various data structures.

Course Code: CSL0306

Course Name: Operating System   **Semester:** III

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	08	B. Tech. (CSE)

Objective(s): Aim of teaching the subject: Operating systems are an essential part of any computer system. This field is undergoing rapid change, as computers are now prevalent in virtually every application, from games for children to sophisticated planning tools for multinational and Government firms.

Course Outcomes: After completion of this course a student would be able to

- Understand the fundamentals concepts of operating systems, its design a development.
- Understand the concept of a process and how does it exists in a system with multiple process. Student will be able to different between user and system process.
- Synchronization of process. Inter process communication.
- How memory in the system is managed
- How can one security to their systems.

Course Code: CSL 0358

Course Name: Software Engineering   **Semester:** III

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	**03**	**01**	**00**	**04**	**08**	**B. Tech. CSE**

Objective(s): The course aims to introduce students with software with engineering principles, and is intended for all who plan their studies and careers in software engineering/development.

Course Outcomes: After successful completion of this course, students would be able to:

1. Describe key activities in software development and role of modelling
2. Select and supply the knowledge techniques, skills and modern tools of the discipline to effective software development process.
3. Explain key concept in software development such as risk and quality.
4. Be a effective software development team member who contributes innovative software design solutions to the resolutions or problems.

Course Code: CSL0307

Course Name: Basic Python Programming   **Semester:** III

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
5	3	1	2	6	10	B. Tech. (CSE)

Objective(s): The main aim of the course is to introduce multi paradigms of programming language using python programming language. The course introduces core components of different paradigms

of programming language like interactive, logic, functional, object oriented and web programming based on python language

Course Outcomes: At the end of the course, the students will be able to understand the fundamentals of different programming paradigms using Python language. Upon successful completion of the course, the students will able to design any application based on different Paradigms of programming language.

Course Code: CSP0304

Course Name: SERVER SIDE PROGRAMMING   **Semester:** III

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
2	0	0	4	4	10	B. Tech. (CSE)

Objective(s): This course aims to introduce advanced technologies in Java, and is intended for all who plan to use computer programming in their studies and careers

Course Outcomes: After successful completion of this course, students would be able to:

- understand the advanced Java technologies;
- understand the Web-based programming;
- design, write, and test a Web-based Java application to implement a solution to a given problem specification.

Course Code: CSL0458

Course Name: Computer System Organization   **Semester:** IV

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): The aim of course is to acquaint budding engineers with the basic principles of computer organization, operations and performance of modern day computer systems.

Course Outcomes: After successful completion of this course, students would be able to:

- understand the basics of microprocessor;
- design and understand register transfer language;
- understand how to perform arithmetic operations in computer;
- understand organization of I/O;
- Understand organization of memory.

Course Code: CSL0407

Course Name: Database Management System   **Semester:** IV

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): The overall aim of the course is to cover the fundamentals of database management systems (DBMSs), paying particular attention to relational database systems. The course covers modeling techniques, transferring designs to actual database implementations, SQL, models of query languages, transactions as well as more recent developments.

Course Outcomes:

After successful completion of this course, students would be able to:

- design entity-relationship diagrams to represent simple database application scenarios;
- know how to convert entity-relationship diagrams to relational database schemas in the standard Normal Forms;
- program simple database applications in SQL;
- understand the basic theory of the relational model and both its strengths and weaknesses;
- Familiar with various recent trends in the database area.

Course Code: CSL0460

Course Name: Data Communication and Computer Networks   **Semester:** V

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): This course aims to provide students with a good understanding of the electrical characteristics of digital signals, basic methods of data transmission, in depth knowledge of computer networking with their associated techniques and different protocols.

Course Outcomes: After successful completion of this course, students would be able to

- understand the concepts of data communication and computer networks;
- understand the working of different networking devices;
- understand the concepts of different network protocols.

Course Code: CSL0427

Course Name: Data Science and Data Mining   **Semester:** IV

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	06	10	B. Tech. (CSE)

Objective(s): The objective of this course is to cover Basic about Data Science and data mining.

Course Outcomes:

After successful completion of this course, students would be able to:

- Data Science, data preparation and data preprocessing
- Data mining and association process

Course Code: CSL0409

Course Name: Artificial Intelligence   **Semester:** IV

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): The objective of this course is to cover theoretical and computational methods of artificial intelligence including practical knowledge of intelligent tools. Basic concepts include representation of knowledge and computational methods for reasoning and game playing.

Course Outcomes:

After successful completion of this course, students would be able to:

- identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem;
- Formalize given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc.);
- understand the history, development and various applications of artificial intelligence;
- familiarize with propositional and predicate logic and their roles in logic programming;
- learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems;
- appreciate how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory;
- Development as well as understand the importance of maintaining intelligent systems.

Course Code: CSP0405

Course Name: Mobile application with Android   **IV Semester**

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
02	0	0	04	04	6	B. Tech. (CSE)

Objective: To provide student exposure to Mobile application design and development for Android platform.

Course Outcomes: Design and develop mobile apps, using Android as development platform, with key focus on user experience design, native data handling and background tasks and notifications.

Course Code: CSL0514

Course Name: Advanced Computer Architecture   **Semester:** V

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. (CSE)

Objective(s): This course aims to provide students exposure to computer architecture research, experience in the state of the art microprocessors and computer architecture tools.

Course Outcomes: After successful completion of this course, students would be able to quantitative and qualitative understanding of superscalar, super-pipelined, dataflow and VLIW processors, multiprocessor system architecture.

Course Code: CSL0560

Course Name: Data Communication and Computer Networks   **Semester:** V

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): This course aims to provide students with a good understanding of the electrical characteristics of digital signals, basic methods of data transmission, in depth knowledge of computer networking with their associated techniques and different protocols.

Course Outcomes:

After successful completion of this course, students would be able to:
- understand the concepts of data communication and computer networks;
- understand the working of different networking devices;
- understand the concepts of different network protocols.

Course Code: CSL0559

Course Name: Design and Analysis of Algorithms   **Semester:** V

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): This course aims to analyze the asymptotic performance of algorithms and to synthesize efficient algorithms in common engineering design situations.

Course Outcomes:

After successful completion of this course, students would be able to:

- Learn principles of algorithm design;
- Analyze algorithms and estimate their worst-case and average-case behavior (in easy cases);
- Apply their theoretical knowledge in practice (via the practical component of the course).

Course Code: CSL0508

Course Name: Software Engineering **Semester:** V

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. (CSE)

Objective(s): This course aims to introduce students with software engineering principles, and is intended for all who plan their studies and careers in software engineering/development.

Course Outcomes: After successful completion of this course, students would be able to:

- describe key activities in software development and the role of modelling;
- select and apply the knowledge, techniques, skills, and modern tools of the discipline to effective software development process;
- explain key concepts in software development such as risk and quality;
- Be an effective software development team member who contributes innovative software design solutions to the resolution of problems.

Course Code: CSL0516

Course Name: Theory of Computation **Semester:** V

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. (CSE)

Objective(s): This course aims to provide student with a comprehensive background in underlying concepts and techniques used in Theory of Computation.

Course Outcomes: After successful completion of this course, students would be able to:

- acquire a full understanding of automata theory;
- have a clear understanding of grammars, DFA, NFA PDA and TM;
- Designing and minimization of automata and grammars.

Course Code: CSP0504

Course Name: Advanced Java (Lab)   **Semester:** V

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
01	0	0	2	02	02	B. Tech. (CSE)

Objective(s): This course aims to introduce advanced technologies in Java, and is intended for all who plan to use computer programming in their studies and careers.

Course Outcomes: After successful completion of this course, students would be able to:

- understand the advanced Java technologies;
- Understand the Web-based programming; design, write, and test a Web-based Java application to implement a solution to a given problem specification.

Course Code: CSL0628

Course Name: Artificial Intelligence   **Semester:** VI

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): The objective of this course is to cover theoretical and computational methods of artificial intelligence including practical knowledge of intelligent tools. Basic concepts include representation of knowledge and computational methods for reasoning and game playing.

Course Outcomes:

After successful completion of this course, students would be able to:
- identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem;
- Formalize given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc.);
- understand the history, development and various applications of artificial intelligence;
- familiarize with propositional and predicate logic and their roles in logic programming;

- learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems;
- appreciate how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory;
- Development as well as understand the importance of maintaining intelligent systems.

Course Code: CSL0620

Course Name: Compiler Design   **Semester:** VI

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. (CSE)

Objective(s): This course aims to teach students:

- principals involved in compiler design;
- Major concepts areas of language translation and compiler design;
- Various phases of compiler and its use.

Course Outcomes:

After successful completion of this course, students would be able to:

- Design and implement a prototype compiler;
- Use the different compiler construction tools.

Course Code: CSL0610

Course Name: Computer Graphics and Multimedia   **Semester:** VI

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): The objective of this course is to provide an introduction to fundamental concepts in computer graphics from a practical perspective. It aims to cover mathematical concepts essential for computer graphics, graphics devices, various algorithms and multimedia systems.

Course Outcomes: After successful completion of this course, students would be able to:

- have a comprehensive knowledge of computer graphics;
- have in depth knowledge if image synthesis and shape modeling;
- enhance their perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information;
- have a practical knowledge of demonstration of scan conversion, transformation and clipping;
- know characteristics of multimedia application and able to design animated objects;

- Design new algorithm or modify existing one for new applications.

Course Code: CSL0661

Course Name: Distributed Systems   **Semester:** VI

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. (CSE)

Objective(s): The objective of this course is to provide an introduction to distribution systems, remote machine operations and services.

Course Outcomes: After successful completion of this course, students would be able to:

- explain the goals of distributed system;
- introduce the use of client server communication;
- explain the fundamental fault detection and tolerance;
- configuration of web server;
- role and need of CORBA, DCOM and other web services;
- creating client server model using RMI operations.

Course Code: CSL0662

Course Name: Dot Net Programming with C#   **Semester:** VI

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): This course aims to provide fundamental concepts in .NET Programming from a practical perspective. It aims to cover:

- .NET Technology and Framework;
- object oriented programming concepts;
- C#.NET programming for console, windows and web-based application development.

Course Outcomes:

After successful completion of this course, students would be able to:

- understand the basic concepts of .NET technology;
- understand the basic concepts and principles of object oriented programming;
- design, write, and test a C# program to implement a solution to a given problem specification;
- introduce client/server programming concepts using .Net technology;
- Understand database connectivity through ADO.NET technology.

Course Code: CSL0722
Course Name: Cryptography and Network Security   **Semester-VII**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. (CSE/ICT)

Objective: The objective of this course module is to make the student to understand the fundamental principles of secure access control models, techniques, security issues and challenges, understanding of different cryptographic protocols and techniques**.**

Course Outcomes: Having successfully completed this course, students should be able to:

- Implement the cryptographic techniques over any networks.
- Impart knowledge on encryption techniques, design principles and modes of operation at layered architecture of network.

Course Code: CSL0717
Course Name: Digital Image Processing   **Semester-VII**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
5	3	1	2	05	10	B. Tech. (CSE)

Objective: The objectives of this course module are to learn the techniques and tools for digital image processing, and finally also introduce image analysis techniques in the form of image segmentation.

Course Outcomes:

Having successfully completed this course, students should be able to:

- Acquire the fundamental concepts of a digital image processing system.
- Use imaging processing and programming fundamentals to solve problems encountered in the imaging systems.
- To design and implement with Matlab algorithms for digital image processing operations such as histogram equalization, enhancement, restoration, filtering, and denoising.
- Students will gain theoretical knowledge and practical skills on digital image processing, analysis, and applying these techniques in various remote sensing applications.

Course Code: CSL0763
Course Name: Data Mining and Warehousing   **Semester-VII**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)

4	3	0	1	4	06	B. Tech. (CSE/ICT)

Objective: To introduce Data Mining as a cutting edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modeling, and identifying new trends and behaviors.

Course Outcomes: At the end of the module student will able to:

- Discuss the role of data warehousing and enterprise intelligence in industry and government.
- Summarize the dominant data warehousing architectures and their support for quality attributes.
- Compare and contrast the dominant data mining algorithms.
- Demonstrate an appreciation of the importance of paradigms from the fields of Artificial Intelligence and Machine Learning to data mining.
- Overview of the developing areas - web mining, text mining etc. and ethical aspects of data mining.

Course Code: CSE0725

Course Name: Soft Computing   **Semester:** VII

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. (CSE)

Objective(s): The objective of this course is to give students knowledge of soft computing theories fundamentals, i.e. of fundamentals of non-traditional technologies and approaches to solving hard real-world problems, namely of fundamentals of artificial neural networks, fuzzy sets and fuzzy logic and genetic algorithms.

Course Outcomes: After successful completion of this course, students would be able to acquire knowledge of soft computing theories fundamentals and so they will be able to design program systems using approaches of these theories for solving various real-world problems

Course Code: CSE0776

Course Name: Programming with Python

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): The main aim of the course is to introduce multi paradigms of programming language using python programming language. The course introduces core components of different paradigms of programming language like interactive, logic, functional, object oriented and web programming based on python language.

Course Outcomes: After successful completion of this course, students would be able to:

- understand the fundamentals of different programming paradigms using Python language;
- design any application based on different Paradigms of programming language.

Course Code: CSL0727
Course Name: RESEARCH METHODOLOGY   Semester-VII

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	3	0	1	4	8	B. Tech. (CSE/ICT)

COURSE OBJECTIVE: The course of Research Methodology is designed such that in the wake of computing the course students.

- Acquire skills to locate research problem areas & identify problem & plan, organize, design and conduct research to help in solving the identified problems.
- Develop competency to write and present research reports.

Course Code: CSL0864
Course Name: Modeling and Simulation   **Semester-VIII**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
5	3	2	1	6	06	B. Tech. (CSE/ICT)

Objective: To introduce the techniques of soft computing and adaptive neuro-fuzzy inference systems which differ from conventional AI and computing in terms of its tolerance?

Course Outcomes: This course is designed to teach students the concepts of fuzzy sets, fuzzy logic, and use of heuristics based on human experience and also familiarize with genetic algorithms and other random search procedures

Course Code: CSE0852
Course Name: Cloud Computing   **Semester-VIII**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	3	0	1	4	06	B. Tech. (CSE/ICT)

Objective:

- To analyzing the extent of adoption for cloud computing services in various organizations.
- To study of information protection resources from supply chain threats and security assurances associated with the hardware and software used.
- To derive forecast of upcoming trends in adoption of cloud computing.

Course Outcomes:

Hands on: Microsoft Azure, Amazon-AWS Services, Sales force.com

Course Code: CSE0815

Course Name: Information Storage and Management   **Semester-**VIII

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	2	0	2	3	6	B. Tech. (CSE/ICT)

Objective:
- To understand basic concepts how does data store from one source to destination through network. Moreover,
- To understand issues and challenges of storage technology, storage solution and storage on cloud.

Course Outcomes:
To be able to understand the internal concepts of data storage from one computer network to another and to develop secure and reliable database network scenario and to understand its issues and challenges.

Course Code: CSL0865

Course Name: Software Project Management   **Semester:** VIII

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. (CSE)

Objective(s): This course aims to teach students to:
- understand fundamental principles of software project management;
- familiar with different methods and techniques used for software project management.

Course Outcomes: After successful completion of this course, students would be able to:
- understand how software projects are planned, implemented, monitored and controlled;
- understand various project management activities, for example, project scheduling, tracking, risk analysis, quality management, and cost estimation using different techniques;
- understand various issues and challenges faced during software project management process;
- understand why majority of software projects fails and how failure probability can be reduced;
- recognize the role of software product manager.

Course Code: CSL0840

Course Name: Ad-hoc Networks   **Semester:** VIII

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. + M. Tech. (Int.) [CSE]

Objective(s): The main objective of this course is to introduce students to wireless communication and the mathematical models and network protocol designs in Ad-hoc networks.

Course Outcomes: After successful completion of this course, students would be able to understand the internal concepts of data transfer from one computer network to another and to develop small wireless networking scenario and to understand its issues and challenges

Course Code: CSL0845

Course Name: Information Theory and Coding   **Semester:** VIII

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. + M. Tech. (Int.) [CSE]

Objective(s): The main objective of this course is to introduce information theory, fundamentals of error control coding techniques and their applications.

Course Outcomes: After successful completion of this course, students would be able to
- understand the basic notions of information and channel capacity;
- understand how error control coding techniques are applied in communication systems.

Course Code: CSL0970

Course Name: Computer Vision   **Semester:** IX

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	06	10	B. Tech. + M. Tech. (Int.) [CSE]

Objective(s): This course aims to address algorithms for automated computer vision. It focuses on building mathematical models of images and objects and using these to perform inference. Students will learn how to use these models to automatically find, segment and track objects in scenes, perform face recognition and build three-dimensional models from images.

Course Outcomes: After successful completion of this course, students would be able to:
- understand about machine visual aspect towards modeling and building an object;
- understand and apply a series of probabilistic models of images and objects in machine vision systems;
- understand the principles behind face recognition, segmentation, image parsing, super-resolution, object recognition, tracking and 3D model building.

Course Code: CSL0973

Course Name: Big Data Analytics   **Semester:** IX

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
05	3	1	2	04	08	B. Tech. + M. Tech. (Int.) [CSE]

Objective(s): This course aims to provide grounding in basic and advanced methods to big data technology and tools, including MapReduce and Hadoop and its ecosystem. It foundation level training that enables immediate and effective participation in big data projects.

Course Outcomes: After successful completion of this course, students would be able to:

- understand big data and its present and future;
- understand Apache Hadoop and Cloudera;
- understand tips and tricks for Big Data use cases and solutions;
- build and maintain reliable, scalable, distributed systems with Apache Hadoop;
- apply Hadoop ecosystem components.

Course Code: CSE0972

Course Name: Mobile Computing   **Semester:** IX

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. + M. Tech. (I.) [CSE]

Objective(s): This course aims to introduce students with techniques mobile computing.

Course Outcomes: After successful completion of this course, students would be able to:

- understand the architecture of modern mobile computers;
- understand the characteristics and limitations of mobile hardware devices including their user-interface modalities.

Course Code: CSE0968

Course Name: Human-Computer Interaction   **Semester:** IX

Credits	L	T	P	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
04	3	1	0	04	08	B. Tech. + M. Tech. (I.) [CSE]

Objective(s): This course aims to introduce computer science students to the theory and practice of developing user interfaces.

Course Outcomes: After successful completion of this course, students would be able to:

- critically discuss common methods in the user-centered design process and the appropriateness of individual methods for a given problem;
- use, adapt and extend classic design standards, guidelines, and patterns;
- employ selected design methods and evaluation methods at a basic level of competence;
- build prototypes at varying levels of fidelity, from paper prototypes to functional, interactive prototypes.

M.Tech./ M.Tech. (Integrated) Computer **Science & Engineering**
Program Objectives:

A post graduate of the Computer Science and Engineering Program should:

Students will demonstrate their ability to adapt to a rapidly changing environment by having learned and applied new skills and new technologies.

Program Outcomes:

A post graduate of the Computer Science and Engineering Program will demonstrate:

a. An understanding of professional, ethical, legal, security and social issues and responsibilities **(professional integrity).**

b. The broad education necessary to analyze the local and global impact of computing and engineering solutions on individuals, organizations, and society **(engineering impact assessment skills).**

Course Code: PGCS105
Course Name: Advance DBMS   **Semester-I**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4(L)+2(P) = 06	2	1	2	5	**8** Min Marks Duration	**B. Tech. (CSE/IT)**

Objective: The main objective of this course is to provide insight of transaction, concurrency, distributed database and other advanced concepts to students.

Program Outcomes: To acquaint the students with some relatively advanced issues. Students should be able to gain an awareness of the distributed database and other advanced topics.

Course Code: PGCS-0102
Course Name: Design and Analysis of Algorithms   **Semester-I**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	2	1	-	3	5	**B. Tech. (CSE/IT)**

Objective: The objective is to introduce the algorithms in various domains and emphasis on design as well as analysis in the appropriate way to organize the study of algorithm.

Course Outcomes: This course is designed and implement efficient algorithm using C or C++.

- To understand and evaluate the efficiency & efficacy of various algorithms.

Course Code: PGCS-0103

Course Name: Information and Network Security　　　　　　　　**Semester-I**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	2	1	-	3	5	B. Tech. (CSE/IT)

Objective: The objective of this module is to introduce the security computer, network and web security, IDS and cryptography.

Course Outcomes: Provides knowledge of different techniques which have been used in past and are being used currently for network security. It provides a platform to develop new techniques for new upcoming networks like VANET and other ad hoc networks along with conventional networks.

Course Code: PGCS104
Course Name: Real Time System　　　　　　　　　　**Semester-I**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	2	1	-	3	5	B. Tech. (CSE)

Objective: To do an advanced study of the Instruction Set Architecture, Instruction Level Parallelism with hardware and software approaches, Memory and I/O systems and real time with an analysis of their performance.

Course Outcomes: To acquaint the students with some relatively advanced issues of operating system. Students should be able to gain an awareness of the real time system and other advanced topics of its application.

Course Code: PGCS202/PGIT202
Course Name: Adhoc Networks.　　　　　　　　　　**Semester-II**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	2	1	1	3	6	B. Tech. (CSE/IT)

Objective:

- To understand basic concepts how does data transfer from one source to destination worldwide through wireless?
- To understand issues and challenges of ad networks.

Course Outcomes:

- To be able to understand the internal concepts of data transfer from one computer network to another and to develop small wireless networking scenario and to understand its issues and challenges.

Course Code: PGCS201

Course Name: Advance Computer Architecture.   **Semester-II**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	2	1		3	6	B. Tech. (CS)

Objective: The course provides a comprehensive study of scalable and parallel computer architectures for understanding and justifying a proportional increase in performance with increase in system resources.

Course Outcomes:

After completion of this course a student will be able to :

- Understand the principles of Parallel processing, analysis of parallel computing. And performance analysis of parallel systems
- Understand and explore the concepts of vector sand array processing and will be able to analyze the performance of these processors against uniprocessor non pipelined systems.
- Understand the architecture of multi processor systems and how parallelism can be achieved in Multiprocessor systems.

Course Code: PGCS-205/PGIT-205

Course Name: Artificial Intelligence   **Semester-II**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	3	0	1	5	8	B. Tech. (CSE/ICT)

Objective(s): The objective of this course is to cover theoretical and computational methods of artificial intelligence including practical knowledge of intelligent tools. Basic concepts include representation of knowledge and computational methods for reasoning and game playing.

Course Outcomes:

After successful completion of this course, students would be able to:

- identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem;

- Formalize given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc.);
- understand the history, development and various applications of artificial intelligence;
- familiarize with propositional and predicate logic and their roles in logic programming;

Course Code: PGCS203

Course Name: Data Mining & Data Warehousing   **Semester-II**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	3	1	0	5	8	B. Tech. (CSE/ICT)

Objective: This course will provide a comprehensive introduction to techniques in data mining and knowledge discovery. The material will be presented both from a database perspective and a machine learning perspective. The course will cover both basic and advanced techniques for uncovering interesting data patterns hidden in large data sets.

Course Outcomes: At the end of the module students should have:

- A critical awareness of current problems and research issues in Data Mining.

- A comprehensive understanding of current advanced scholarship and research in data mining and how this may contribute to the effective design and implementation of data mining applications.

- The ability to consistently apply knowledge concerning current data mining research issues in an original manner and produce work which is at the forefront of current developments in the sub-discipline of data mining.

- A conceptual understanding sufficient to evaluate critically current research and advanced scholarship in data mining.

Course Code: PGCS-204/PGIT-204
Course Name: Simulation & Modeling   **Semester-II**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	2	1	2	5	8	B. Tech. (CSE/ICT)

Objective: This course provides an introduction to system modeling using both computer simulation and mathematical techniques. The application areas considered are wide-ranging, although the emphasis is on the analysis of computer and communication systems using a variety of modeling paradigms such

as simulation, queuing & PERT. The course is self-contained, both in terms of notes and supporting software.

Course Outcomes: By the end of the course students will be able to apply the fundamental laws of performance analysis to establish the relationships between workload parameters and system performance for a given system. They will also be able to develop performance models for simple real-world systems and will be able to solve those models to obtain meaningful performance measures. They will thus be able to analyze system responsiveness, scalability etc. as a function of workload.

Course Code: PGCS302

Course Name: Information Storage and Management   **Semester-III**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	2	0	2	3	6	B. Tech. (CSE/ICT)

Objective:

- To understand basic concepts how does data store from one source to destination through network. Moreover,

- To understand issues and challenges of storage technology, storage solution and storage on cloud.

Course Outcomes:

To be able to understand the internal concepts of data storage from one computer network to another and to develop secure and reliable database network scenario and to understand its issues and challenges.

Course Code: PGCS301

Course Name: Internet Protocols and Network Management   **Semester-III**

CREDITS	L	P	T	Contact Hours (per week)	Independent Study Hours (per week)	Section (Group)
4	2	0	2	3	6	B. Tech. (CSE/ICT)

Objective:

- To understand basic concepts how does data transfer from one source to destination worldwide through network? Moreover,

- To understand issues and challenges of internet technology and networking protocols.

Course Outcomes: To be able to understand the internal concepts of data transfer from one computer network to another and to develop small wireless networking scenario and to understand its issues and challenges.

BCA / BCA (Honors) Bachelor of Computer Applications
Program Objectives:

A graduate of the Computer Applications should:

    a. Students will demonstrate their ability to adapt to a rapidly changing environment by having learned and applied new skills and new technologies.

    b. Students will develop professional skills that prepare them for immediate employment and for life-long learning in areas of computer Applications and related fields which involves use of their Skills as a Computer Application professional

Program Outcomes:

A graduate of the Computer Application will demonstrate:

    c. An understanding of professional, ethical, legal, security and social issues and responsibilities **(professional integrity).**

    d. The broad education necessary to analyze the local and global impact of computing and Application solutions on individuals, organizations, and society **(Professional impact assessment skills).**

    e. An ability to design and conduct experiments, as well as to analyze and interpret data **(information retrieval skills).**

    f. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability, and sustainability **(creative skills).**

    g. An ability to function effectively on multi-disciplinary teams **(teamwork).**

Course Code: BCA-101

Course Name: Computer Fundamental and Applications   **Semester:** I

Theory	Tutorial	Practical	Total credits
3	1	2	5

Course Objective: The proposed course exposes the students to Computer Fundamentals. The Core Modules of this course includes computer components, working with DOS, Windows and MS-Office.

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

- Understand and Identify components of computer.
- Work in the DOS & Windows.
- Familiar with MS-office components such as Word, PowerPoint, Excel.

Course Code: BCAH-101

Course Name: Essentials of Information Technology   **Semester:** I

Theory	Tutorial	Practical	Total credits
3	1	2	5

Course Objective:

- Basics of computer system with various hardware/software components;
- Basics of computer networks, operating system and Internet with their applications;
- Basics of website designing;
- Basics of programming modules.

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

- familiar with fundamentals of computer systems with various hardware/software components;
- understand operating systems, computer networks, and Internet;
- have a practical experience of website designing;
- have practical experience of programming modules.

Course Code: BCA-103 / BCAH-103
Course Name: Programming in C   **Semester:** I

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective: The aims of this course are to provide a solid introduction to programming in C and to provide an overview of the principles and constraints that affect the way in which the C programming languages have been designed and are used.

Course Outcome: At the end of the course students should

- Be able to read, write and understand C programs.
- Understand the interaction between C programs and the host operating system.
- Be familiar with the structure of C program execution in machine memory.
- Understand the object-oriented paradigm presented by C.
- Understand the potential dangers of writing programs in C.

Course Code: BCA-104 / BCAH-104
Course Name: Digital Computer Principles   **Semester:** I

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective: The aims of this course are to present the principles of combinational and sequential digital logic design and optimization at a gate level and to outline the basic memory, device (I/O).

Course Outcome: At the end of the course students should

- Understand the relationships between combination logic and Boolean algebra, and between sequential logic.
- To design and minimize combinational logic

- Appreciate tradeoffs in complexity and speed of combinational designs
- Understand how state can be stored in a digital logic circuit
- Understand the difference between asynchronous and synchronous logic.
- Know how to design a simple finite state machine from a specification and be able to implement this in gates and edge triggered flip-flops.

Course Code: BCA-202 / BCAH-202

Course Name: Data Structures   **Semester:** II

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective: The aim of this course is to provide an introduction to computer algorithms and data structures, with an emphasis on foundational material.

Course Outcome: At the end of the course students should

- Have a good understanding of how several fundamental algorithms work, particularly those concerned with sorting and searching
- Have a good understanding of the fundamental data structures used in computer science
- Be able to design new algorithms or modify existing ones for new applications and reason about the efficiency of the result

Course Code: BCA-204 / BCAH-204

Course Name: Operating Systems   **Semester:** II

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective: The overall aim of this course is to provide a general understanding of the structure and key functions of the operating system. Case studies will be used to illustrate and reinforce fundamental concepts.

Course Outcome: At the end of the course students should

- Describe the general structure and purpose of an operating system;
- Explain the concepts of process, address space, and file;
- Compare and contrast various CPU scheduling algorithms;
- Understand the differences between segmented and paged memories, and be able
- To describe the advantages and disadvantages of each;
- Compare and contrast polled, interrupt-driven and DMA-based access to I/O devices.

Course Code: BCA-205 / BCAH-205

Course Name: Database Management Systems   **Semester:** II

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective: The overall aim of the course is to cover the fundamentals of database management systems (DBMSs), paying particular attention to relational database systems. The course covers modeling techniques, transferring designs to actual database implementations, SQL, models of query languages, transactions as well as more recent developments

Course Outcome: At the end of the course students should

- Be able to design entity-relationship diagrams to represent simple database application scenarios;
- Know how to convert entity-relationship diagrams to relational database schemas in the standard Normal Forms;
- Be able to program simple database applications in SQL;
- Understand the basic theory of the relational model and both its strengths and weaknesses;
- Be familiar with various recent trends in the database area.

Course Code: BCA-301 / BCAH-301

Course Name: E-Commerce   **Semester:** III

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective: As the Internet establishes itself as the way of doing business, a tertiary qualification in e-Commerce will give students a relevant, contemporary place in today's workforce. The e-Commerce will impart the definitive understanding of what e-business is, how it works, why it works, and where it's going.

Students will study aspects of the future of business, such as the impact of e-commerce on traditional management systems, business-to-business and business-to-consumer transaction relationships, electronic money and online payment systems.

Course Outcome: At the end of the course students should

- Understand and manage the interplay between people, technologies and organization that underlies e-business
- Understand the technologies and processes of e-business infrastructure
- Exploit new business models and marketplace structures enabled by electronic communications
- Communicate the technical and managerial aspects of e-business
- Understand e-business risks and security

Course Code: BCA-302 / BCAH-302

Course Name: Computer System Organization   **Semester:** III

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective:

- The aim of this course is to have the hardware implementation of memory management.
- To outline the basic memory, device (I/O).

Course Outcome: At the end of the course students should

- Understand the concept of program execution.
- To design and understand register transfer language
- Understand memory and I/O organization.
- Understand the difference between asynchronous and synchronous data transfer.
- Understand e-business risks and security

Course Code: BCA-303 / BCAH-303

Course Name: Software Engineering   **Semester:** III

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective(s): The course aims to introduce students with software with engineering principles, and is intended for all who plan their studies and careers in software engineering/development.

Course Outcomes: After successful completion of this course, students would be able to:

- Describe key activities in software development and role of modelling
- Select and supply the knowledge techniques, skills and modern tools of the discipline to effective software development process.
- Explain key concept in software development such as risk and quality.
- Be an effective software development team member who contributes innovative software design solutions to the resolutions or problems.

Course Code: BCA-304 / BCAH-304

Course Name: Object Oriented Programming with C++   **Semester:** III

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective(s): The aim of teaching this course is that students should have conceptual and practical knowledge of Object oriented methodology

Course Outcomes: Upon successful completion of this course, the students will learn various concepts and techniques for problem solving and will implement those ideas using C++ programs.

Course Code: BCA-305 / BCAH-305

Course Name: Dot Net Framework with C#   **Semester:** III

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective(s): The course aims to introduce following objectives.

- Understand .NET Technology and Framework
- Understand the VB.NET basics
- Fundamental of Visual Basic and development of Windows Applications
- Operators, Conditional structure and control flow, Method
- Knowing about OOP'S Concept
- Understand Exception handling Collection.
- Know about Database Connection and its classes.
- Know about Delegates and Event.
- Introduction of text or character manipulation
- Understanding about design Patterns

Course Outcomes: After successful completion of this course, students would be able to:

- Express the power of a platform Independent technology
- Explain comparison between VB6.0 and Visual Basic.Net
- Introduce the use of client/server programming using .Net FW.
- Explain the Fundamental of Access specifies, constructor and namespaces
- Express the power of method overloading and method overriding and uses of abstract classes.
- Role and Need of Interfaces to develop real time Application
- Implement the concept of exception handling Real Time Application
- Implement Language Independency and Window Application using Visual Studio IDE.
- Implement Real World Application by handling multiple objects using file Handling.
- Connect an Application to A remote database through ADO.NET Technology

Course Code: BCAH-307

Course Name: Linux Programming   **Semester:** III

Theory	Tutorial	Practical	Total credits
-	-	6	3

Objective(s): This course provides students with basic Unix/Linux experience some important practical skills in using the Unix shell as an efficient working environment. It also introduces some popular software-engineering tools for working in teams, as well as formatting and data-analysis tools for preparing dissertations and scientific publications. These skills are essential not only for future practical CST projects, but for participating effectively in most real-world software projects.

Course Outcomes: After successful completion of this course, students would be able to:

- Be confident in performing routine user tasks on a POSIX system, understand command-line user-interface conventions and know how to find more detailed documentation;
- Appreciate how a range of simple tools can be combined with little effort in pipes and scripts to perform a large variety of tasks;
- Be familiar with the most common tools, file formats and configuration practices;
- Be able to understand, write, and maintain shell scripts and makefiles;
- Appreciate how using revision control systems and fully automated build processes help to maintain reproducibility and audit trails during software development;

Course Code: BCA-402 / BCAH-402

Course Name: Computer Networks   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): The purpose of this course is to study and understand the components of computer network and the issues in designing a network. The course provides the basics of data communication and later on the principles of designing the networks and analyzing the performance of various networks.

Course Outcomes: After successful completion of this course, students would be able to:

- Understand the need and application areas of networking.
- Identify the functions of components of computer networks.
- Identify and use various network interfacing such as hubs, switches etc. devices as per the need.
- Analyze the performance of a network for a given scenario.
- Identify the various models such as TCP/IP, ATM etc. of the computer Networks that are used predominantly in real world.

Course Code: BCA-403 / BCAH-403

Course Name: Enterprise Resource Planning   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective(s): Enterprise Resource Planning delves on the evolution, implementation, and advantages of ERP, providing a comprehensive coverage of the ERP market as well as the different ERP modules.

Course Outcomes: After successful completion of this course, students would be able to:
- To know the basics of ERP
- To understand the key implementation issues of ERP
- To know the business modules of ERP
- To be aware of some popular products in the area of ERP
- To appreciate the current and future trends in ERP

Course Code: BCA-404 / BCAH-404

Course Name: Java Programming   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective(s): The purpose of this course is to provide an adequate knowledge of core Java Technology, OOP concepts, so that learner will be able to build software utilities and desktop using JAVA.

Course Outcomes: After successful completion of this course, students would be able to:

- Express the power of a platform Independent technology
- Explain comparison between java and C++
- Explain the Fundamental of Access specifies, constructor and packages
- Concept of method overloading and method overriding and uses of abstract classes.
- Role and Need of Interfaces to develop real time Application
- implement the concept of exception handling in Real Time Application
- Implement Window Application using AWT and JDBC

Course Code: BCA-405 / BCAH-405

Course Name: Internet & It's Applications   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s):

- To understand the basic concepts about the Internet based protocols
- understand about the applications to develop the web pages
- Basic knowledge of the web publishing tools.

Course Outcomes: After successful completion of this course, students would be able to:

- Understand the technology behind the internet.
- Appreciate how internet can be used.

- Understand services such as email, file download, instant massing, web browsing, remote login and telnet.
- See the relationship between tags in the HTML document and the resulting display.
- Have understanding how a server transfer files on a computer disk to a browser.
- Have good understanding of how different tags are used to design web pages.
- Understand to collect web pages in the form of web site.

Course Code: BCAH-407

Course Name: Web Designing with PHP   **Semester:** IV

Theory	Tutorial	Practical	Total credits
-	-	6	3

Objective(s):
- To get the practical knowledge of PHP
- To develop website using Xampp or Wamp server.
- To know the framework architecture of .NET
- To work easily from database.

Course Outcomes: After successful completion of this course, students would be able to:
- Introduce the use of client/server programming.
- Role and Need of Interfaces to develop real time Application
- Implement the concept of exception handling Real Time Application
- Implement Web Application using static and dynamic pages.
- Implement Real World Application by handling multiple objects using file Handling.
- Connect an Application to A remote database.
- Role of Remote Programming for distributed computing.
- Role of HTML and Client SideScripting.
- Designing and Consuming WebServices.

Course Code: BCA-502 / BCAH-502

Course Name: Computer Graphics   **Semester:** V

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): The essence of computer graphics is the visual synthesis of real and imaginary objects which are indistinguishable. The ubiquity of computer graphics in everyday life cannot be denied anymore. It provides the enabling technology for a wide range of applications in the sciences, engineering, arts, and entertainment

Course Outcomes: After successful completion of this course, students would be able to:

- Understand the role of the subject in computer science.
- How to design various objects.
- How to handle two & three dimensional objects.
- To characteristics of understand multimedia applications.
- Be able to design new algorithms or modify existing ones for new applications and reason about the efficiency of the result.

Course Code: BCA-503 / BCAH-503

Course Name: Dot Net Framework with C#   **Semester:** V

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s):

- Understand .NET Technology and Framework
- Understand the VB.NET basics
- Fundamental of Visual Basic and development of Windows Applications
- Operators, Conditional structure and control flow, Method
- Knowing about OOP'S Concept
- Understand Exception Handling Collection.
- Know about Database Connection, its classes, about Delegates and Event.
- Introduction of text or character manipulation
- Understanding about design Patterns

Course Outcomes: After successful completion of this course, students would be able to:

- Express the power of a platform Independent technology
- Explain comparison between VB6.0 and Visual Basic.Net
- Introduce the use of client/server programming using .Net FW.
- Explain the Fundamental of Access specifies, constructor and namespaces
- Express the power of method overloading and method overriding and uses of abstract classes.
- Role and Need of Interfaces to develop real time Application
- Implement the concept of exception handling Real Time Application
- Implement Language Independency.
- Implement Window Application using Visual Studio IDE.
- Implement Real World Application by handling multiple objects using file Handling.
- Connect an Application to A remote database through ADO.NET Technology.

Course Code: BCA-504 / BCAH-504

Course Name: Information Storage and Management   **Semester:** V

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective(s): The aims of this course are to present the impact of Information Technology Management, information system concepts, IT infrastructure and new IT initiatives.

Course Outcomes: After successful completion of this course, students would be able to:

- Understand the concept of data, information and knowledge and their relationship
- Ethical issues affecting information system
- IT in management
- MIS concepts
- New IT trends

Course Code: BCAH-506

Course Name: Oracle   **Semester:** V

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): The overall aim of the lab is to cover the fundamentals of database management systems (DBMSs), paying particular attention to relational database systems. The course covers modeling techniques, transferring designs to actual database implementations, SQL, models of query languages, transactions as well as more recent developments.

Course Outcomes: After successful completion of this course, students would be able to:

- Be able to design entity-relationship diagrams to represent simple database application scenarios;
- Know how to convert entity-relationship diagrams to relational database schemas in the standard Normal Forms;
- Be able to program simple database applications in SQL;
- Be familiar with various recent trends in the database area.

Course Code: BCA-601 / BCAH-601

Course Name: Software Project Management   **Semester:** VI

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): The aims of this course are to present the impact of Information Technology Management, information system concepts, IT infrastructure and new IT initiatives.

Course Outcomes: After successful completion of this course, students would be able to:

- Understand the concept of data, information and knowledge and their relationship
- Ethical issues affecting information system
- IT in management
- MIS concepts
- New IT trends

Course Code: BCA-602 / BCAH-602

Course Name: Multimedia Systems   **Semester:** VI

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): Multimedia has become an indispensable part of modern computer technology. The aim of this course is to gain an intuitive understanding of multimedia system.

Course Outcomes: After successful completion of this course, students would be able to:

- Understand multimedia tools and their application.
- Address issues in effectively representing, processing, and retrieving multimedia data such as sound and music, graphics, image and video.
- Use of multimedia in web technologies and web design.
- Gain hands-on experience in those areas by implementing some components of a multimedia streaming system as their projects.

Course Code: BCA-603 / BCAH-603

Course Name: E-Commerce   **Semester:** VI

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective: As the Internet establishes itself as the way of doing business, a tertiary qualification in e-Commerce will give students a relevant, contemporary place in today's workforce. The e-Commerce will impart the definitive understanding of what e-business is, how it works, why it works, and where it's going.

Students will study aspects of the future of business, such as the impact of e-commerce on traditional management systems, business-to-business and business-to-consumer transaction relationships, electronic money and online payment systems.

Course Outcome: At the end of the course students should

- Understand and manage the interplay between people, technologies and organization that underlies e-business

- Understand the technologies and processes of e-business infrastructure
- Exploit new business models and marketplace structures enabled by electronic communications
- Communicate the technical and managerial aspects of e-business
- Understand e-business risks and security

Course Code: BCA-604 (Elective-I (C)) / BCAH-604 (Elective-I (C))

Course Name: Web Technologies   **Semester:** VI

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective:
- Description about the applications to develop the web pages
- Basic knowledge of the web publishing tools.
- To know about the advanced application tools for designing the web sites.
- Event and Event Handling
- To understand about the Scripting languages.

Course Outcome: At the end of the course students should
- Understand the technology behind the internet,
- Appreciate how internet can be used in social environment,
- Understand services such as email, file download, instant messaging, web browsing, remote login and telnet.
- See the relationship between tags in the HTML document and the resulting display.
- Have understanding how a server transfer files on a computer disk to a browser.
- Have good understanding of how different tags are used to design web pages.

Course Code: BCAH-606 (Elective-II (A))

Course Name: Web Technologies   **Semester:** VI

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective: The purpose of this course is to express the power of JAVA technology in the development of web application and network application, connectivity with database 2 and 3 tier applications.

Course Outcome: At the end of the course students should
- Understand the technology behind the internet,
- Appreciate how internet can be used in social environment,

- Understand services such as email, file download, instant messaging, web browsing, remote login and telnet.
- See the relationship between tags in the HTML document and the resulting display.
- Have understanding how a server transfer files on a computer disk to a browser.
- Have good understanding of how different tags are used to design web pages.

MCA (Master of Computer Applications)
Program Objectives:
A Post graduate of the Master of Computer Application Program should:
- Ability to pursue a career in IT industry / consulting / research and development, teaching and allied fields related to computer science.
- Understanding, detecting, and building computer programs in areas related to algorithms, system software, multimedia, web design, and big data analytics for efficient design of computer-based systems of varying complexity.

Program Outcomes:
On completion of MCA degree, the graduates will be able to:

- Apply the knowledge of mathematics and computing fundamentals to various real life applications for any given requirement
- Design and develop applications to analyze and solve all computer science related problems
- Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects
- Analyze and review literatures to invoke the research skills to design, interpret and make inferences from the resulting data
- Integrate and apply efficiently the contemporary IT tools to all computer applications
- Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations
- Involve in perennial learning for a continued career development and progress as a computer professional
- Function effectively both as a team leader and team member on multi-disciplinary projects to demonstrate computing and management skills
- Communicate effectively and present technical information in oral and written reports

- Utilize the computing knowledge efficiently in projects with concern for societal, environmental, and cultural aspects
- Function competently as an individual and as a leader in multidisciplinary projects
- Create and design innovative methodologies to solve complex problems for the betterment of the society
- Apply the inherent skills with absolute focus to function as a successful entrepreneur.

Course Code: MCA-102

Course Name: Computer Organization & Architecture   **Semester:** I

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): The aim of this course is to provide the understanding of digital logic design, computer organization and architecture.

Course Outcomes: After successful completion of this course, students would be able to:
- Understand the relationships between Boolean algebra, and logic system.
- To design and minimize combinational and sequential logic circuits.
- Understand the register transfer language and micro-operations.
- Know computer organization and architecture.
- Understand the organization of I/O.
- Understand how memories are organized.

Course Code: MCA-103

Course Name: Operating System   **Semester:** I

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective(s):
- The overall aim of this course is to provide a general understanding of the structure and key functions of the operating system. Case studies will be used to illustrate and reinforce fundamental concepts.

Course Outcomes: After successful completion of this course, students would be able to:
- describe the general structure and purpose of an operating system;
- explain the concepts of process, address space, and file;
- compare and contrast various CPU scheduling algorithms;
- understand the differences between segmented and paged memories.
- compare and contrast polled, interrupt-driven and DMA-based access to I/O devices.

Course Code: MCA-104

Course Name: Essentials of Information Technology   **Semester:** I

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): The overall aim of this course is to

- basics of computer system with various hardware/software components;
- basics of computer networks, operating system and Internet with their applications;
- basics of website designing;
- using MS Office (MS Word, MS Excel, MS PowerPoint);

Course Outcomes: After successful completion of this course, students would be able to:

- familiar with fundamentals of computer systems with various hardware/software components;
- understand operating systems, computer networks, and Internet;
- have a practical experience of website designing;
- have practical experience of computer programming;
- have practical experience of MS Office package.

Course Code: MCA-106

Course Name: Programming in C   **Semester:** I

Theory	Tutorial	Practical	Total credits
-	-	8	4

Objective(s): The aims of this course are to provide a solid introduction to programming in C and to provide an overview of the principles and constraints that affect the way in which the C programming languages have been designed and are used.

Course Outcomes: After successful completion of this course, students would be able to:

- Be able to read and write C programs.
- Understand the interaction between C programs and the host operating system.
- Be familiar with the structure of C program execution in machine memory.
- Understand the object-oriented paradigm presented by C
- Understand the pros and cons of writing programs in C

Course Code: MCA-202

Course Name: Data Structures   **Semester:** II

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective(s): The aim of this course is to provide an introduction to computer algorithms and data structures, with an emphasis on foundational material.

Course Outcomes: After successful completion of this course, students would be able to:

- Have a good understanding of how several fundamental algorithms work, particularly those concerned with sorting and searching
- Have a good understanding of the fundamental data structures used in computer science
- Be able to analyze the space and time efficiency of most algorithms
- Be able to design new algorithms or modify existing ones for new applications and reason about the efficiency of the result.

Course Code: MCA-203

Course Name: Software Engineering   **Semester:** II

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): This course has a major objective of introducing students to the essential aspects of Software Engineering methods to ensure good quality software products as a part of system development project.

Course Outcomes: After successful completion of this course, students would be able to:

- Understand and Identify Software Engineering paradigms
- Work with software process models.
- Various tools and techniques for software Designing, analysis.
- How to divide software development cycle into various phases and operations that needed to be done in these phases.
- Familiar with software testing, maintenance & assurance.
- Understand case tools

Course Code: MCA-204

Course Name: Database Management Systems   **Semester:** II

Theory	Tutorial	Practical	Total credits
3	1	6	7

Objective(s): The overall aim of the course is to cover the fundamentals of database management systems (DBMSs), paying particular attention to relational database systems. The course covers modeling techniques, transferring designs to actual database implementations, SQL, models of query languages, transactions as well as more recent developments.

Course Outcomes: After successful completion of this course, students would be able to:

- Be able to design entity-relationship diagrams to represent simple database application scenarios;
- Know how to convert entity-relationship diagrams to relational database schemas in the standard Normal Forms;
- Be able to program simple database applications in SQL;
- Understand the basic theory of the relational model and both its strengths and weaknesses;
- Be familiar with various recent trends in the database area.

Course Code: MCA-205

Course Name: Object Oriented Programming with C++   **Semester:** II

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective(s): The aim of teaching this course is that students should have conceptual and practical knowledge of object oriented methodology with practical implementation in C++.

Course Outcomes: After successful completion of this course, students would be able to:

- understand various concepts of object oriented programming;
- have a practical experience of computer programming;
- write programs for real life problems;
- learn other (object oriented) programming languages easily

Course Code: MCA-302

Course Name: Programming with Java   **Semester:** III

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective(s): The purpose of this course is to study and understand Core of Java Technology. The course provides the basics oops concept, development of desktop and network and Multithreaded Database centric applications.

Course Outcomes: After successful completion of this course, students would be able to:

- Express the power of a platform Independent technology
- Explain comparison between java and C++
- Introduce the use of client site programming using Applet
- Explain the Fundamental of Access specifies, constructor and packages
- Express the power of method overloading and method overriding and uses of abstract classes.
- Role and Need of Interfaces to develop real time Application
- Creating thread with the thread class and runnable interface

- Implement the the concept of exception handling Real time Application
- Implement Web Application using Applet.
- Implement Window Application using AWT Swing and JDBC
- Implement Real World Application by handling mutable objects using file Handling.
- Connect a Application to A remote database through JAVA database connectivity
- Express the power of java in Distributed Application through Networking, socket and
- RMI Programming.
- Role of RMI Programming for distributed computing

Course Code: MCA-303

Course Name: Design and Analysis of Algorithm   **Semester:** III

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): The Objective of this is to provide the understanding of analysis and design of different problem solving approaches.

Course Outcomes: After successful completion of this course, students would be able to:
- Solve problems related to Artificial intelligence.
- Design the networks for various application in areas like mechanical and electrical,
- Design and analyze the algorithms.

Course Code: MCA-304

Course Name: Computer Networks   **Semester:** III

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective(s): The purpose of this course is to study and understand the components of computer Network and the issues in designing a network. The course provides the basics of data communication and later on the principles of designing the networks and analyzing the performance of various networks.

Course Outcomes: After successful completion of this course, students would be able to:
- Solve problems related to Artificial intelligence.
- Design the networks for various application in areas like mechanical and electrical,
- Design and analyze the algorithms.

Course Code: MCA-305 (Elective-I (D))

Course Name: PHP   **Semester:** III

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective(s): The purpose of this course is to study.

- To get the practical knowledge of PHP
- To develop website using Xampp or Wamp server.
- To know the framework architecture of .NET
- To work easily from database.

Course Outcomes: After successful completion of this course, students would be able to:

- Introduce the use of client/server programming.
- Role and Need of Interfaces to develop real time Application
- Implement the concept of exception handling Real Time Application
- Implement Web Application using static and dynamic pages.
- Implement Real World Application by handling multiple objects using file Handling.
- Connect a Application to A remote database.
- Role of Remoting Programming for distributed computing.
- Role of HTML and Client SideScripting.
- Designing and Consuming WebServices.

Course Code: MCA-401

Course Name: Data Warehousing and Mining   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): To introduce Data Mining as a cutting edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modeling, and identifying new trends and behaviors.

Course Outcomes: After successful completion of this course, students would be able to:

- They learn how to model large databases for decision making.
- Understand the nature of specific data mining techniques such as cluster, association, classification, characterization etc.

Course Code: MCA-402

Course Name: Computer Graphics   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): The essence of computer graphics is the visual synthesis of real and imaginary objects which are indistinguishable. The ubiquity of computer graphics in everyday life cannot be denied

anymore. It provides the enabling technology for a wide range of applications in the sciences, engineering, arts, and entertainment.

Course Outcomes: After successful completion of this course, students would be able to:

- Understand the role of the subject in computer science.
- How to design various objects.
- How to handle two & three dimensional objects.
- To characteristics of understand multimedia applications.
- Be able to design new algorithms or modify existing ones for new applications and reason about the efficiency of the result.

Course Code: MCA-403

Course Name: Theory of Computations   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective(s): This course covers the theoretical computer science areas of formal languages and automata, computability. At the heart of theoretical computer science are questions of both philosophical and practical importance. What does it mean for a problem to be solvable by computer? What are the limits of computability? Which types of problems can be solved efficiently? What are our options in the face of intractability? This subject covers such questions in the content of a wide-ranging exploration of the nexus between logic, complexity, and examines many important (and sometimes surprising) results about the nature of computing.

Course Outcomes: After successful completion of this course, students would be able to:

- Design, manipulate, and reason about formal computational models, such as automata and Turing machines
- Describe the limitations of different types of computing devices
- Identify relations between classes of computational problems, formal languages, and computational models
- Have a good knowledge of formal computation and its relationship to languages.
- Be able to classify languages into their types.
- Be able to understand formal reasoning about languages.

Course Code: MCA-404

Course Name: Information Storage and Management   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective(s): The aims of this course are to present the impact of Information Technology, Storing information concepts, IT infrastructure and new IT initiatives.

Course Outcomes: After successful completion of this course, students would be able to:

- Understand the concept of data, information and knowledge and their relationship
- Ethical issues affecting information system
- IT trends in storing and managing of information.
- Cloud concepts

Course Code: MCA-405 (Elective-II (C))

Course Name: PYTHON   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	4	6

Objective(s): The main aim of the course is to introduce multi paradigms of programming language using python programming language. The course introduces core components of different paradigms of programming language like interactive, logic, functional, object oriented and web programming based on python language.

Course Outcomes: After successful completion of this course, students would be able to:

At the end of the course, the students will be able to understand the fundamentals of different programming paradigms using Python language. Upon successful completion of the course, the students will able to design any application based on different Paradigms of programming language.

Course Code: MCA-501

Course Name: Unix and Shell Programming   **Semester:** V

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): Unix is essentially a case study of Operating system with an view of how system software operates and handles various OS tasks like process scheduling, memory management etc., this subject will make student aware of how internally an OS operates and Process it uses to handle the issues generated.

Course Outcomes: After successful completion of this course, students would be able to:

- Handling Input Output devices and managing multiple process and resources.
- Handling interrupts and system calls generated during process execution.
- Understanding Shell, its environment and commands of shell
- User permissions and File security

Course Code: MCA-502

Course Name: Artificial Intelligence   **Semester:** V

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): To learn the basics of designing intelligent agents that can solve general purpose problems, represent and process knowledge, plan and act, reason under uncertainty and can learn from experiences

Course Outcomes: After successful completion of this course, students would be able to:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc.).
- Understand the history, development and various applications of artificial intelligence;
- Familiarize with propositional and predicate logic and their roles in logic programming;
- Learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems;
- Appreciate how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory
- Development as well as understand the importance of maintaining intelligent systems.

Course Code: MCA-503

Course Name: Web Technologies   **Semester:** V

Theory	Tutorial	Practical	Total credits
3	1	2	5

Objective(s): The aim of designing following subject is:

    A) to understand the concept of XHTML.

    B) to understand the concept of advance TCP/IP

Course Outcomes: After successful completion of this course, students would be able to:

- The concept of core TCP/IP protocol
- TCP/IP application protocols
- Advance concepts and new technologies
- Html and java script
- Extended markup language

Course Code: MCA-504 (Elective-III (E))

Course Name: Information Storage and Management   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective(s): The aims of this course are to present the impact of Information Technology, Storing information concepts, IT infrastructure and new IT initiatives.

Course Outcomes: After successful completion of this course, students would be able to:

- Understand the concept of data, information and knowledge and their relationship
- Ethical issues affecting information system
- IT trends in storing and managing of information.
- Cloud concepts

Course Code: MCA-505 (Elective-IV (B))

Course Name: Network Security   **Semester:** IV

Theory	Tutorial	Practical	Total credits
3	1	-	4

Objective(s): This course builds upon the basic concepts introduced in Network. The student will be able to show an understanding of the security issues surrounding networks. This will include the security of Web servers and networks generally, including attaching to the Internet. The role of Firewalls and Intrusion Detection Systems in the Enterprise will be covered. Penetration testing and the legal issues surrounding this area will also be addressed. The purpose of network security is essentially to prevent loss, through misuse of data. There are a number of potential pitfalls that may arise if network security is not implemented properly.

Course Outcomes: After successful completion of this course, students would be able to:

- Undertake routine tasks to secure a network.
- Understand the factors that place an internet-based information system at risk and apply this knowledge to simple case studies.
- Evaluate procedures to secure a system against failure, theft, invasion and sabotage.
- Understand and apply the concepts for administrating a small company's network