

DEPARTMENT :- BCA

PROGRAMME OUTCOME

- To provide thorough understanding of nature, scope and application of computer and computer languages
- To develop interdisciplinary approach among the students

PROGRAMME SPECIFIC OUTCOME

- focuses on preparing student for roles pertaining to computer applications and IT industry
- Start from the basics and in every semester learns each and everything about computers.
- develop programming skills, learn applications, packages, programming languages and modern techniques of IT
- get skill and info not only about computer and information technology but also in common, organization and management
- Learn programming language such as Java, C++, HTML, SQL, etc...
- Provide a solid base in the area of IT like networking, computer graphics, web development and software quality management.
- Empower students to pursue further studies to get specialization in Computer Science and Applications
- Equip the students with essential skill required to work in the IT sector as programmer, system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.
- Train students in a way that will enable them to work in public sector undertakings and Government organizations.

COURSE OUTCOME

SEMESTER – I

1101 Business and Technical communication skills

Course Objective:

- To understand and demonstrate writing and speaking processes through invention, organization, drafting, revision, editing, and presentation.
- To understand the importance of specifying audience and purpose and to select appropriate communication choices.
- To understand and appropriately apply modes of expression, i.e., descriptive, expositive, narrative, scientific, and self-expressive, in written, visual, and oral communication.

- To participate effectively in groups with emphasis on listening, critical and reflective thinking, and responding.
- To understand and apply basic principles of critical thinking, problem solving, and technical proficiency in the development of exposition and argument
- To develop the ability to research and write a documented paper and/or to give an oral presentation.

Course Outcomes:

- Discuss the importance of effective communication in business.
- Differentiate between different methods of communication Methods of Communication.
- Discuss the importance of staying connected with colleagues, other professionals, and customers in the digital age.
- Propose solutions to challenges that may occur in communication, especially across cultures in a global marketplace.
- Discuss the role and types of teams in workplace communication.
- Discuss strategies for working in collaborative projects.
- Discuss best practices in workplace etiquette.

1102 Principles and Practice of Accountancy

Course Objective:

- To introduce students with the fundamental concepts of accountancy.
- To familiarize the students with the usage of accountancy in computer related technologies.
- To make them aware about the banking and financial scenario in today's competitive world.

Course Outcomes:

At the end of the course, a student will be able to:

- Develop and understand the nature and purpose of financial statements in relationship to decision making.
- Develop the ability to use the fundamental accounting equation to analyze the effect of business transactions on an organization's accounting records and financial statements.
- Develop the ability to use a basic accounting system to create (record, classify, and summarize) the data needed to solve a variety of business problems.
- Develop the ability to use accounting concepts, principles, and frameworks to analyze and effectively communicate information to a variety of audiences.
- Develop the ability to use accounting information to solve a variety of business problems
- Develop the ability to interact well with team members.

- Demonstrate knowledge of each step in the accounting cycle.
- Use debit and credit accounting to record and adjust basic business transactions.
- Use basic financial statement ratio analysis to evaluate financial performance.

1103 Introduction to Programming and Problem Solving using C

Course Objective:

- The course is designed to provide complete knowledge of C language.
- Students will be able to develop logics which will help them to create programs, applications in C.
- Also by learning the basic programming constructs they can easily switch over to any other language in future

Course Outcomes:

At the end of the course, a student will be able to:

- After the completion of this course, the students will be able to develop applications.
- So the students will get knowledge of mathematical and algorithmic logics, to understand major control structures such as branching, loops and expressions, to be able to use functions and to create arrays of elementary objects in their simple C programs.
- The major objective is to provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
- Understanding a functional hierarchical code organization.
- Ability to define and manage data structures based on problem subject domain.
- Ability to work with textual information, characters and strings.
- Ability to work with arrays of complex objects.
- Understanding a concept of object thinking within the framework of functional model.
- Understanding a concept of functional hierarchical code organization.
- Understanding a defensive programming concept.
- Ability to handle possible errors during program execution.

1104 Computer Fundamentals and Operating Systems

Course Objective:

- 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

Course 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
- Evaluate the requirement for process synchronization and coordination handled by operating system
- Describe and analyze the memory management and its allocation policies.
- 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.

1201 Problem Solving Using C Lab

Course Objective:

- The purpose of this course is to introduce to students to the field of programming using C language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

- To make the student learn a programming language.
- To learn problem solving techniques.
- To teach the student to write programs in C and to solve the problems.

Course Outcomes:

After Completion of this course the student would be able to

- Read, understand and trace the execution of programs written in C language.
- Write the C code for a given algorithm.
- Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
- Write programs that perform operations using derived data types.

1202 GNU / Linux Lab

Course Objective:

- To introduce Basic Unix general purpose Commands.
- To learn Unix editor environment using vi editor.
- To introduce shell script and sed concepts.
- To learn file management and permission commands.

Course Outcomes:

- Identify the basic Unix general purpose commands.
- Apply and change the ownership and file permissions using Unix commands.
- Demonstration of shell scripts and sed.
- Apply basic of administrative task.

SEMESTER – II

2101 Introduction to Logic Circuits and Digital Design

Course Objective:

- To understand operation of semiconductor devices.

- To understand DC analysis and AC models of semiconductor devices.
- To apply concepts for the design of Regulators and Amplifiers
- To verify the theoretical concepts through laboratory and simulation experiments.
- To implement mini projects based on concept of electronics circuit.
- To understand number representation and conversion between different representation in digital electronic circuits.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- To understand characteristics of memory and their classification.
- To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines.
- To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL.
- To implement combinational and sequential circuits using VHDL.

Course Outcomes:

- Understand the current voltage characteristics of semiconductor devices,
- 2. Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation,
- 3. Design and analyze of electronic circuits,
- Evaluate frequency response to understand behavior of Electronics circuits.
- Develop a digital logic and apply it to solve real life problems.
- Analyze, design and implement combinational logic circuits.
- Classify different semiconductor memories.
- Analyze, design and implement sequential logic circuits.
- Analyze digital system design using PLD.
- Simulate and implement combinational and sequential circuits using VHDL systems.

2102 Discrete Structures and Graph Theory

Course Objective:

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. Analyze the growth of elementary functions and determine their Big-O value; analyze simple
- Algorithms and compare two algorithms based on computational complexity. Use elementary number theory including the divisibility properties of numbers to determine
- prime numbers and composites, the greatest common divisor, and the least common multiple; perform modulo arithmetic and computer arithmetic. Apply algorithms to problems including searching algorithms, base conversion algorithms,
- and the Euclidean algorithm. 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. Identify the base step and the recursive or inductive step in applied problems and give a
- Recursive and a non-recursive definition for an iterative algorithm. Verify that a simple program segment with given initial and final assertions is correct using
- The rule of inference for verification of partial correctness and loop invariants. Solve counting problems by applying elementary counting techniques using the product.
- Sum rules, permutations, combinations, the pigeon-hole principle, and binomial expansion. Solve discrete probability problems and use sets to solve problems in combinatorial.
- Probability theory. Solve problems using recurrence relations and recursion to analyze algorithms and programs
- such as finding Fibonacci numbers, the Ackerman function 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. Describe N-ary relations between N sets and apply basic database operations such as
- Projections to N-ary relations. Determine if a given graph is simple or a multigraph, directed or undirected, cyclic or
- Acyclic, and determine the connectivity of a graph. Represent a graph using an adjacency list and an adjacency matrix and apply graph theory to
- Application problems such as computer networks. Determine if a graph has an Euler or a Hamilton path or circuit.
- Determine if a graph is a binary tree, N-ary tree, or not a tree; use the properties of trees to
- Classify trees, identify ancestors, descendants, parents, children, and siblings; determine the level of a node, the height of a tree or subtree and apply counting theorems to the edges and vertices of a tree. Perform tree traversals using preorder, inorder, and postorder traversals and apply these

- Traversals to application problems; use binary search trees or decision trees to solve problems. Evaluate Boolean functions and simplify expression using the properties of Boolean algebra;
- Apply Boolean algebra to circuits and gating networks. Use finite-state machines to model computer operations

Course Outcomes:

Students completing this course will be able to express a logic sentence in terms of

- Predicates, quantifiers, and logical connectives. Students completing this course will be able to apply the rules of inference and methods of Boolean algebra.
- Proof including direct and indirect proof forms, proof by contradiction, and mathematical induction. Students completing this course will be able to use tree and graph algorithms to solve
- Problems. Students completing this course will be able to evaluate Boolean functions and simplify
- Expressions using the properties of Boolean algebra.

2103 Advanced C

Course Objective:

- The course is oriented to those who want to advance structured and procedural programming understating and to improve C programming skills. The major objective is to provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.

Course Outcomes:

- Understanding a functional hierarchical code organization.
- Ability to define and manage data structures based on problem subject domain.
- Ability to work with textual information, characters and strings.
- Ability to work with arrays of complex objects.
- Understanding a concept of object thinking within the framework of functional model.
- Understanding a concept of functional hierarchical code organization.
- Understanding a defensive programming concept. Ability to handle possible errors during program execution.

2104 Environmental Science and RTI

Course Objective:

- Apply and communicate quantitative reasoning and/or mathematical skills or statistical models to field and laboratory data to study scientific phenomena.
- Use geospatial technologies (including global positioning systems, geographic information systems, and remote sensing) to address environmental problems.
- Demonstrate and awareness of ecosystems in the context of coupled human-environmental interactions.
- Competently implement an individual or group scientific project, which may include literature review, experimental design, data collection, data analysis, and reporting.

Course Outcomes:

- Apply mathematical concepts, including statistical methods, to field and laboratory data to study scientific phenomena.
- Use GIS to solve geospatial problems.
- Understand the complex relationships between natural and human systems.
- Design and execute a scientific project.

2201 Advanced C Lab

Course Objective:

Understand the basic concepts of C programming.

- Practice the use of conditional and looping statements.
- Implement arrays, functions and pointers.
- Gain skills to handle strings and files.

Course Outcomes:

After successful completion of this course, the students should be able to

- Employ good software engineering practices such as incremental development, data integrity checking and adherence to style guidelines.
- Select and model data using primitive and structured types.
- Construct programs that demonstrate effective use of C features including arrays, structures, pointers and files.

2202 Open Source Operating System and Application Software Lab

Course Objective:

- To write develop internet applications using open source tools.
- To provide knowledge about Open Source Technologies and to help in understanding the programming aspects of Personal Home Page (PHP).
- To provide a basic idea of Open source technology, their software development process so as to understand the role and future of open source software in the industry.
- To get familiar with basics of the Internet Programming.
- To acquire knowledge and skills for creation of web site considering both client and server side

Course Outcomes:

At the end of the course, a student will be able to:

- Recognize the benefits and features of Open Source Technology.
- Interpret, Contrast and compare open source products among themselves
- Implement interactive web page(s) using HTML.
- Design a responsive web site using HTML
- Build Dynamic web site using server side PHP Programming and Database connectivity.

SEMESTER - III

3101 Introduction to Microprocessor

Course Objective:

- To introduce students with the architecture and operation of typical microprocessors and microcontrollers.
- To familiarize the students with the programming and interfacing of microprocessors and microcontrollers.
- To provide strong foundation for designing real world applications using microprocessors and microcontrollers.

Course Outcomes:

- Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller's internal architecture and its operation within the area of manufacturing and performance.
- Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor.
- Compare accepted standards and guidelines to select appropriate Microprocessor (8085) to meet specified performance requirements.
- Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor.
- Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.
- Evaluate assembly language programs and download the machine code that will provide solutions realworld control problems.
- The student will be able to analyses, specify, design, write and test assembly language programs of moderate complexity.
- The student will be able to select an appropriate 'architecture' or program design to apply to a particular situation; e.g. an interrupt-driven I/O handler for a responsive real-time machine. Following on from this, the student will be able to design and build the necessary programs.
- The student will be able to calculate the worst-case execution time of programs or parts of programs, and to design and build, or to modify, software to maximize its run time memory or execution-time behavior.
- The student will be able to characterize and predict the effects of the properties of the bus on the overall performance of a system.
- The student will be able to describe some of the characteristics of RISC and CISC architectures.

3102 Numerical Method and Algorithms

Course Objective:

- To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
- To solve problems in the field of Applied Mathematics, Theoretical Physics and Engineering which requires computing of numerical results using certain raw data?
- To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations.
- To deal with various topics like finding roots of equations, solving systems of linear algebraic equations, interpolation and regression analysis, numerical integration & differentiation, solution of differential equation, boundary value problems, solution of matrix problems.
- To facilitate numerical computing.

Course Outcomes:

On completion of the course students will be able to

- Apply Numerical analysis which has enormous application in the field of Science and some fields of Engineering.
- Familiar with finite precision computation.
- Familiar with numerical solutions of nonlinear equations in a single variable.
- Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations.
- Familiar with calculation and interpretation of errors in numerical method.

3103 Computer Organisation and Architecture

Course Objective:

- To understand the structure, function and characteristics of computer systems.
- To understand the design of the various functional units and components of computers.
- To identify the elements of modern instructions sets and their impact on processor design.
- To explain the function of each element of a memory hierarchy,
- To identify and compare different methods for computer I/O.
- Discuss the basic concepts and structure of computers.

Course Outcomes:

On completion of the course, student will be able to:

- Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os.
- Analyze the performance of commercially available computers.
- To develop logic for assembly language programming
- Be familiar with the cost-performance issues and design trade-offs in designing and constructing a computer processor including memory.
- Be familiar with the quantitative performance evaluation of computer systems.
- Be familiar with the cache subsystem.
- Understand the theory and architecture of central processing unit.
- Analyze some of the design issues in terms of speed, technology, cost, performance.
- Design a simple CPU with applying the theory concepts.
- Use appropriate tools to design verify and test the CPU architecture.
- Learn the concepts of parallel processing, pipelining and interprocessor communication.
- Understand the architecture and functionality of central processing unit.
- Exemplify in a better way the I/O and memory organization
- Discuss about different types of peripheral devices of computer.
- the use of cache memory and virtual memory

3104 File Structure and Database Management System

Course Objective:

- The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course Outcomes:

Upon successful completion of this course, students should be able to:

- Describe the fundamental elements of relational database management systems.
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- Design ER-models to represent simple database application scenarios.

- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
- Improve the database design by normalization.
- Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.

3201 Microprocessor Lab

Course Objective:

- Learn assembling and disassembling of PC.
- Get hands on experience with Assembly Language Programming.
- Study interfacing of peripheral devices with 8086 microprocessor.
- Understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors.
- Learn fundamentals of designing embedded systems
- Write and debug programs in Dynalog 8085 hardware kits

Course Outcomes:

At the end of the course, a student will be able to:

- Apply the fundamentals of assembly level programming of microprocessors 8085.
- Build a program on a microprocessor using arithmetic & logical instruction set of 8085.
- Develop the assembly level programming using 8085 loop instruction set.
- Write programs based on string and procedure for 8085 microprocessor.
- Analyze abstract problems and apply a combination of hardware and software to address the problem

3202 Database Management System Lab

Course Objective:

- To provide a sound introduction to the creation of problem statements from real life situations.

- To give a good formal foundation on the relational model of data and usage of Relational Algebra.
- To introduce the concepts of basic SQL as a universal Database language.
- To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
- To enable the design of an efficient database using normalization concepts.
- To enable students to be create indexes for databases for efficient retrieval.

Course Outcomes:

- Develop the ability to handle databases of varying complexities
- Use advanced database Programming concepts
- Construct problem definition statements for real life applications and implement a database for the same.
- Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra.
- Create and populate a RDBMS, using SQL.
- Write queries in SQL to retrieve any type of information from a data base.
- Analyze and apply concepts of normalization to design an optimal database.
- Implement indexes for a database using techniques like B or B+ tree

SEMESTER - IV

4101 Data Structures and File Organization

Course Objective:

- To impart the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques.
- To understand basic concepts about stacks, queues, lists, trees and graphs.
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.

Course Outcomes:

At the end of the course, a student will be able to:

- Ability to analyze algorithms and algorithm correctness.
- Ability to summarize searching and sorting techniques.
- Ability to describe stack, queue and linked list operation. 4 Ability to have knowledge of tree and graphs concepts.
- Select appropriate data structures as applied to specified problem definition.
- Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
- Students will be able to implement Linear and Non-Linear data structures.
- Implement appropriate sorting/searching technique for given problem.
- Design advance data structure using NonLinear data structure.
- Determine and analyze the complexity of given Algorithms.

4102 Information System Analysis and Design

Course Objective:

- Understand both the nature of ‘information systems analysis and design’ and its various components.
- Demonstrate knowledge on the different phases of Systems Development Life Cycle (SDLC).
- Appreciate the use of systems design techniques, methodologies, and tools.

Course Outcomes:

At the end of the course, a student will be able to:

- Identify various types of information systems concepts and terminologies.
- Explain the types of business needs that can be addressed using information technology based solutions.
- Discuss the initial phases of the System Development Life Cycle (SDLC) using analytical tools and quantitative techniques used to identify problems.
- Define problems and opportunities that initiate projects.
- Write clear and concise business requirements and convert them into technical specifications.

- Evaluate information systems projects to identify various aspects of feasibility of these projects.
- Apply at least one specific methodology or tool for analyzing a business situation (a problem or opportunity) by modeling it using a formal technique.
- Transform requirements specifications into practical and achievable design specifications.
- Evaluate a wide range of problems related to the analysis and design of information systems.

4103 Introduction to software Engineering

Course Objective:

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To Explain methods of capturing, specifying, visualizing and analyzing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.
- To understand need of project management and project management life cycle.

Course Outcomes:

At the end of the course, a student will be able to:

- Define various software application domains and remember different process model used in software development.
- Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.
- Convert the requirements model into the design model and demonstrate use of software and user interface design principles.
- Distinguish among SCM and SQA and can classify different testing strategies and tactics and compare them.

- Justify role of SDLC in Software Project Development and they can evaluate importance of Software Engineering in PLC.

4104 Object oriented programming using C++

Course Objective:

- To master all techniques of software development in the C++ Programming Language and demonstrate these techniques by the solution of a variety of problems spanning the breadth of the language including C++11 changes.

Course Outcomes:

At the end of the course, a student will be able to:

- Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
- Demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
- Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching.
- Learn syntax, features of, and how to utilize the Standard Template Library. Learn other features of the C++ language including templates, exceptions, forms of casting, conversions, covering all features of the language. Learn features of the language which can be problematic with execution time or space and some techniques to resolve them. Learn features of the language which are non-deterministic, should not be utilized in hard real-time systems, and techniques for replacing those features. Learn the C++ language changes and Boost library.

4201 Data Structures Lab

Course Objective:

- The course is designed to develop skills to design and analyze simple linear and non linear data structures.

- It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.
- It enables them to gain knowledge in practical applications of data structures.

Course Outcomes:

At the end of the course, a student will be able to:

- Be able to design and analyze the time and space efficiency of the data structure.
- Be capable to identify the appropriate data structure for given problem.
- Have practical knowledge on the applications of data structures.
- Select appropriate data structures as applied to specified problem definition.
- Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
- Students will be able to implement Linear and Non-Linear data structures.
- Implement appropriate sorting/searching technique for given problem.
- Design advance data structure using Non-Linear data structure.
- Determine and analyze the complexity of given Algorithms.

4202 Object oriented Programming C++ Lab

Course Objective:

- Understand the fundamentals of object oriented concepts.
- Be able to write a C++ program to solve various problems.
- Be able to choose appropriate data structures to solve the problems.

Course Outcomes:

After successful completion of this course, the students should be able to

- Understand the object oriented concepts for implementation.
- Implement the data structure concepts.

- Use the basic object-oriented design principles in computer problem solving
- Use the basic principles of software engineering in managing complex software project.
- Program with advanced features of the C++ programming language.

SEMESTER - V

5101 Data Communication and Networking

Course Objective:

- Learn how computer network hardware and software operate
- Investigate the fundamental issues driving network design
- Learn about dominant network technologies

Course Outcomes:

Outcomes #1

- 1a.** Show clear understanding of the basic concepts of data communications including the key aspects of networking and their interrelationship, packet switching, circuit switching and cell switching as internal and external operations, physical structures, types, models, and internetworking.
- 1b.** Demonstrate the ability to unambiguously explain networking as it relates to the connection of computers, media, and devices (routing).
- 1c.** Able to intelligently compare and contrast local area networks and wide area networks in terms of characteristics and functionalities. Able to identify limitations of typical communication systems.
- 1d.** Able to evaluate the performance of a single link, logical process-to-process (end-to-end) channel, and a network as a whole (latency, bandwidth, throughput).
- 1e.** Able to differentiate among and discuss the four levels of addresses (physical, logical, port, and specific used by the Internet TCP/IP protocols).
- 1f.** Understand the concept of reliable and unreliable transfer protocol of data and how TCP and UDP implement these concepts, to understand the client/server model and socket API with their implications, skills to implement a network protocol based on socket programming.

- 1g.** Demonstrate an understanding of the significance and purpose of protocols and standards and their key elements and use in data communications and networking.
- 1h.** Understand the purpose of network layered models, network communication using the layered concept, and able to compare and contrast Open System Interconnect (OSI) and the Internet Model.

Outcomes #2

- 2a.** Distinguish between analog and digital signals and understand their characteristics
- 2b.** Demonstrate the ability to discuss the relationship between data and signals as well as distinguish among and discuss their types, behavior, properties, characterization, and transmission.
- 2c.** Able to explain how noise, attenuation, and distortion affect signal traveling through a transmission medium; discuss the factors affecting data rate as well as the theoretical limits on data rate over a noiseless and a noisy channel.
- 2d.** Demonstrate clear understanding of digital transmission of analog and digital data, encoding techniques – line encoding (unipolar, polar, and bipolar encoding; e.g. NRZ, RZ, Manchester, PCM, etc.) - techniques used to convert digital data and analog signals to digital signals for parallel and serial transmission.
- 2e.** Show clear and unambiguous understanding of analog transmission of digital and analog data , methods, and the procedures involved in converting digital data and analog low-pass to band-pass analog signals (Modulation – ASK, FSK, PSK, AM, FM, PM). Recognize the advantages and limitations of modulation systems.
- 2f.** Able to distinguish between and compare the main categories of transmission media as well as can compare and contrast their subcategories.
- 2g.** Can effectively discuss that bandwidth utilization is goal-oriented and involves tradeoffs by showing that multiplexing (TDM, FDM, WDM) efficiently use bandwidth while spread spectrum inefficiently use bandwidth to ensure privacy and ant jamming.
- 2h.** Able to compare and contrast the data transmission modes: serial and parallel as well as synchronous, asynchronous, and isochronous with relevant examples.

Outcomes #3

- 3a.** Able to distinguish between the different types of bit errors and can explain the concept of bit redundancy and how it is generally achieved in the facilitation of error detection and the main methods of error correction.

- 3b.** Illustratively explain the concept of Hamming distance, and the significance of the minimum Hamming distance and its relationship to errors as well as detection and correction of errors in block codes.
- 3c.** Can clearly explain the reason for the relatively widespread use of linear block codes as well as distinguish between and compare and contrast parity check codes and Hamming codes.
- 3d.** Show clear understanding of the concept, advantages, and analysis of cyclic codes including their algebraic representation; demonstratively explain the design and implementation of cyclic redundancy check; and able to compare and contrast cyclic redundancy check and checksum in terms of implementation and performance.
- 3e.** Understand the basic difference between data logical link control and media access control; can discuss logical link control with reference to framing, flow and error control, software implemented protocols (for the noiseless and noisy channel) to facilitate reliable inter-node transmission of frames; and show the ability to compare and contrast high-level data link control protocol and point-to-point protocol (HDLC, PPP).
- 3f.** Demonstrate clear and unambiguous understanding of the conceptual difference between the three main classes of multiple access protocols used at the media access control sublayer of the data link layer and show the ability to identify the similarities and differences among protocols in the same class.
- 3g.** Understand connecting LAN's, backbone networks, and virtual LAN's. Students should understand operations of bridges and the spanning tree algorithm.

Outcomes #4

- 4a.** Understand internetworking principles and how the Internet protocols IP, IPv6 and ICMP operate.
- 4b.** Understand routing principles and algorithms, such as distance vector and link state.
- 4c.** Are aware of the routing protocols used on the Internet such as RIP, OSPF, and BGP.
- 4d.** Explain and demonstrate the mechanics associated with IP addressing, device interface, association between physical and logical addressing, sub-netting and super netting.

Outcomes #5

- 5a. Identify the requirements for a high-order communication systems
- 5b. Understand the techniques and protocols used (DSL, SONET, ATM).
- 5c. Know the principles of congestion control and trade-offs in fairness and efficiency.

Outcomes #6

- 6a. Demonstrate the ability for effective verbal communication.

5102 Java Programming

Course Objective:

- To understand how 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.
- To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
- Discuss the principles of inheritance, interface and packages and demonstrate through 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.
- To learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.
- To understand Java Swings for designing GUI applications based on MVC architecture.

Course Outcomes:

- 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
- Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.

- Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
- Identify and describe common abstract user interface components to design GUI in Java using Applet & AWT along with response to events
- Identify, Design & develop complex Graphical user interfaces using principal Java Swing classes based on MVC architecture

5103 Visual and Database Programming

Course Objective:

- Analyze program requirements
- Design/develop programs with GUI interfaces
- Code programs and develop interface using Visual Basic .Net
- Perform tests, resolve defects and revise existing code
- Understand .NET Framework and describe some of the major enhancements to the new version of Visual Basic.
- Describe the basic structure of a Visual Basic.NET project.
- Use main features of the integrated development environment (IDE)
- Create applications using Microsoft Windows® Forms.
- Create applications that use ADO. NET
- Using Crystal Reports

Course Outcomes:

- At the end of the course the participant will Understand .NET Framework and describe some of the major enhancements to the new version of Visual Basic.
- Describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE) .
- Create applications using Microsoft Windows® Forms .
- Create applications like web applications.
- Create applications that use ADO. NET .
- Using Crystal Reports

5104 Internet Programming

Course Objective:

- To get familiar with basics of the Internet Programming.
- To acquire knowledge and skills for creation of web site considering both client and server side programming.

- To gain ability to develop responsive web applications
- To explore different web extensions and web services standards
- To learn characteristics of RIA –Web Mashup Eco System

Course Outcomes:

- Implement interactive web page(s) using HTML, CSS and JavaScript.
- Design a responsive web site using HTML5 and CSS3.
- Demonstrate Rich Understanding a defensive programming concept.
- Internet Application.
- Build Dynamic web site using server side PHP Programming and Database connectivity.
- Describe and differentiate different Web Extensions and Web Services.
- At the completion of this course you should be able to design and develop web pages that incorporate CSS, text, graphics, and other supporting elements using current technologies and authoring tools.
- The course gives you an introduction to computer logic and programming for client-side web programming.
- The course includes designing, coding, debugging, testing, and documenting programs using a high-level, object-oriented, programming language (JavaScript).
- The course also includes advanced CSS, DHTML programming and a client-side programming language.

5201 JAVA Programming LAB

Course Objective:

- Understand fundamentals of programming such as variables, conditional and iterative execution, APIs etc.
- Understand fundamentals of object oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Have the ability to write computer programs to solve specific problems.
- Be able to use the Java SDK environment to create, debug and run Java programs.

Course Outcomes:

After successful completion of this course, the students should be able to

- Understand the Java programming language in the aspects of designing, coding and implementation.
- Know about new ideas and advances, techniques, and tools and to use them effectively.

5202 Internet programming Lab

Course Objective:

- To understand the importance of the web as an effective medium of communication.
- To develop basic skills in analyzing the usability of a web site.
- To develop hands on experience using open source technologies such as HTML, CSS, JavaScript, JS.
- To implement static, dynamic and interactive web pages and web applications.
- To be able to analyze the available open source technologies and select the appropriate one based on need.

Course Outcomes:

After successful completion of this course, the students should be able to

- Design, develop and host a user friendly website.
- Know the usage of APIs.
- Layout management in line with current trend.

SEMESTER – VI

6101 Management Information System

Course Objective:

- To provide an understanding Computer forensics fundamentals
- To analyze various computer forensics technologies
- To provide computer forensics systems
- To identify methods for data recovery.
- To apply the methods for preservation of digital evidence.

- Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
- Students locate and apply case law and common law to current legal dilemmas in the technology field.
- Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions

Course Outcomes:

- Demonstrate effective communication with individuals, teams, and large groups
- Demonstrate effective analytical and critical thinking skills to make an appropriate business related decisions
- Distinguish and analyze ethical problems that occur in business and society
- Apply leadership skills and competencies in business situations
- Illustrate how current technologies and decision-support tools can be utilized to the advantage of business operations.
- Demonstrate an understanding of the major functional areas of Business
- Explain the role and significance of effective management information systems, and describe how they contribute to optimizing organizational performance.
- Explain fundamental database concepts and apply these concepts to the design and development of relational databases.
- Demonstrate the major steps in the design and implementation phases of the system development life cycle (SDLC)
- Demonstrate programming skills to solve common business problems and Web development techniques
- Explain fundamental concepts of data communications, computer networking, and the related hardware.
- Demonstrate technical knowledge of computer networks, information security and information assurance.

6102 Enterprise Resource Planning

Course Objective:

- To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning Technology.
- 2. To focus on a strong emphasis upon practice of theory in Applications and Practicaloriented approach.

- 3. To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.
- To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills.
- With the basic concepts of ERP systems for manufacturing or service companies, and the differences among (Material Requirement Planning) MRP, MRP II, and ERP systems;
- Apply the principles of ERP systems, their major components, and the relationships among these components;
- To comprehend the technical aspects of ERP systems 5. To be able to map business processes using ERP concepts and techniques.

Course Outcomes:

- Make basic use of Enterprise software, and its role in integrating business functions
- Analyze the strategic options for ERP identification and adoption.
- Design the ERP implementation strategies
- Create reengineered business processes for successful ERP implementation.

6103 INTELLIGENT PROPERTY RIGHT, PATENTS AND CYBER LAW

Course Objective:

- To provide an understanding Computer forensics fundamentals
- To analyze various computer forensics technologies
- To provide computer forensics systems
- To identify methods for data recovery.
- To apply the methods for preservation of digital evidence.
- Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
- Students locate and apply case law and common law to current legal dilemmas in the technology field.

- Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions

Course Outcomes:

- Information and risk: models including confidentiality, integrity and availability (CIA); concepts such as probability, consequence, harm, risk identification, assessment and mitigation; and the relationship between information and system risk
- Threats and attacks: threats, how they materialise, typical attacks and how those attacks exploit vulnerabilities
- Cyber security architecture and operations: physical and process controls that can be implemented across an organisation to reduce information and systems risk, identify and mitigate vulnerability, and ensure organisational compliance
- Secure systems and products: the concepts of design, defensive programming and testing and their application to build robust, resilient systems that are fit for purpose
- Cyber security management: understanding the personal, organisational and legal/regulatory context in which information systems could be used, the risks of such use and the constraints (such as time, finance and people) that may affect how cybersecurity is implemented.

6104 E-commerce

Course Objective:

- Define e-commerce and describe how it differs from e-business
- Identify the unique features of e-commerce technology and their business significance
- Describe the major types of e-commerce
- Understand the visions and forces behind the 1 st E-Commerce era
- Describe the major themes underlying the study of e-commerce
- Identify the major academic disciplines contributing to e-commerce research
- Identify the key components of e-commerce business models.
- Describe the major B2C business models.
- Describe the major B2B business models.
- Recognize business models in other emerging areas of e-commerce.
- Understand key business concepts and strategies applicable to e-commerce. Business-to-Consumer E-commerce
- Online businesses attempt to reach individual consumers
- The Growth of B2C E-Commerce Europe is expected to reach €263M by 2011 (Forrester report, 2006)
- Business-to-Business E-commerce
- Businesses focus on sell to other businesses
- Largest form of e-commerce

Course Outcomes:

- Recognize the impact of Information and Communication technologies, especially of the Internet in business operations
- Recognize the fundamental principles of e-Business and e-Commerce
- Distinguish the role of Management in the context of e-Business and e-Commerce
- Explain the added value, risks and barriers in the adoption of e-Business and e-Commerce
- Examine applications of e-Commerce in relation to the applied strategic
- Use tools and services of the internet in the development of a virtual e-commerce site

6201 Project**Course Objective:**

- To make them understand the concepts of Project Management for planning to execution of projects.
- To make them understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.
- To enable them to comprehend the fundamentals of Contract Administration, Costing and Budgeting.
- Make them capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.

Course Outcomes:

- Manage the scope, cost, timing, and quality of the project, at all times focused on project success as defined by project stakeholders.
- Align the project to the organization's strategic plans and business justification throughout its lifecycle.
- Identify project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders.
- Implement project management knowledge, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.
- Adapt projects in response to issues that arise internally and externally.
- Interact with team and stakeholders in a professional manner, respecting differences, to ensure a collaborative project environment.
- Utilize technology tools for communication, collaboration, information management, and decision support.
- Implement general business concepts, practices, and tools to facilitate project success.
- Apply appropriate legal and ethical standards.