Scheme of Instructions & Syllabus
of
Bachelor of Science (Honors)
in
Computer Science
(Effective from session 2025-26)

Total Credit of the Program

Semester	I	II	III	IV	V	VI	Total
Credits	20	22	20	24	22	26	**134**

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STUDY AND EVALUATION SCHEME

B. Sc. (Honors) in Computer Science

(Effective from session 2025 - 26)

SEMESTER I, YEAR I

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BSCS101	Computer Fundamentals and Programming using C	CC1	3+1+0	30	70	100	4
BSCS102	Digital Electronics & Computer Organization	CC2	3+1+0	30	70	100	4
BSCS103	Graph Theory	CC3	5+1+0	50	100	150	6
BSCS104	Industrial Applications	AECC	2+0+0	15	35	50	2
LAB							
BSCS151	Computer Fundamentals and Programming using C Lab	CC1(P)	0+0+4	15	35	50	2
BSCS152	Digital Electronics & Computer Organization Lab	CC2(P)	0+0+4	15	35	50	2
Total				**155**	**345**	**500**	**20**

SEMESTER II, YEAR I

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BSCS201	Data Structures using C	CC4	3+1+0	30	70	100	4
BSCS202	Programming in C++	CC5	3+1+0	30	70	100	4
BSCS203	Operating Systems	CC6	5+1+0	50	100	150	6
BSCS**	GE1	GE	2+0+0	15	35	50	2
LAB							
BSCS251	Data Structures using C Lab	CC4P	0+0+4	15	35	50	2
BSCS252	Programming in C++ Lab	CC5P	0+0+4	15	35	50	2
Total				**155**	**345**	**500**	**20**

L= Lecture**, T=** Tutorial**, P=** Practical**, EE=**End Semester Examination

STUDY AND EVALUATION SCHEME

B. Sc. (Honors) in Computer Science

(Effective from session 2025 - 26)

SEMESTER III, YEAR II

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BSCS301	Database Management Systems	CC7	3+1+0	30	70	100	4
BSCS302	Object-Oriented Programming using Java	CC8	3+1+0	30	70	100	4
BSCS303	Software Engineering	CC9	5+1+0	50	100	150	6
BSCS**	GE2	GE	2+0+0	15	35	50	2
LAB							
BSCS351	Database Management Systems Lab	CC7P	0+0+4	15	35	50	2
BSCS352	Object-Oriented Programming using Java Lab	CC8P	0+0+4	15	35	50	2
Total				**155**	**345**	**500**	**20**

SEMESTER IV, YEAR II

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BSCS401	Computer Graphics	CC10	3+1+0	30	70	100	4
BSCS402	Programming in Python	CC11	3+1+0	30	70	100	4
BSCS403	Cryptography & Data Security	CC12	5+1+0	50	100	150	6
BSCS404	Data Communication and Computer Networks	CC13	5+1+0	50	100	150	6
LAB							
BSCS451	Computer Graphics Lab	CC10(P)	0+0+4	15	35	50	2
BSCS452	Programming in Python Lab	CC11(P)	0+0+4	15	35	50	2
Total				**190**	**410**	**600**	**24**

L= Lecture**, T=** Tutorial**, P=** Practical**, EE=**End Semester Examination

STUDY AND EVALUATION SCHEME

B. Sc. (Honors) in Computer Science

(Effective from session 2025 - 26)

SEMESTER V, YEAR III

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BSCS501	Internet Technologies	CC14	3+1+0	30	70	100	4
BSCS502	GUI using .NET Framework	CC15	3+1+0	30	70	100	4
BSCS503	Data Mining	SEC	2+0+0	15	35	50	2
BSCS*	DSE1	DSE	3+1+0	50	100	150	6
LAB							
BSCS551	Internet Technologies Lab	CC14(P)	0+0+4	15	35	50	2
BSCS552	GUI using .NET Framework Lab	CC15(P)	0+0+4	15	35	50	2
BSCS***	Summer Internship Viva	AECC(P)	0+0+2	15	35	50	2
Total				**170**	**380**	**550**	**22**

SEMESTER VI, YEAR III

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BSCS601	PHP	CC16	3+1+0	30	70	100	4
BSCS602	Multimedia & its applications	CC17	3+1+0	30	70	100	4
BSCS603	Digital Marketing	SEC	2+0+0	15	35	50	2
BSCS*	DSE2	DSE	3+1+0	50	100	150	6
LAB							
BSCS651	PHP Lab	CC16(P)	0+0+4	15	35	50	2
BSCS652	Multimedia & its Applications Lab	CC17(P)	0+0+4	15	35	50	2
BSCS*	DSE3	DSE	0+0+4	50	100	150	6
Total				**205**	**445**	**650**	**26**

L= Lecture**, T=** Tutorial**, P=** Practical**, EE=**End Semester Examination

* ***Student can choose elective from DSE list***

** ***Student can choose elective from GE list***

*** ***After 4th Semester, students will undergo 4 weeks' summer training compulsorily in Public Sector undertakings or Private Sector, known as Industrial Training/Internship. 50 marks will be on the basis of viva of students on their Project experience in 5th Semester.***

Discipline Specific Elective (DSE) List		
Course Code	**DSE**	**Paper Name**
BSCS514	DSE1	Artificial Intelligence
BSCS515	DSE1	Artificial Neural Networks
BSCS516	DSE1	Theory of Computations
BSCS517	DSE1	Software Testing & Quality Assurance
BSCS614	DSE2	Numerical Algorithm & Operation Research
BSCS615	DSE2	E-Business
BSCS616	DSE2	ERP
BSCS617	DSE2	Mobile Computing
BSCS653	DSE3	Major Project
BSCS654	DSE3	Seminar

Skill-Enhancement Elective Courses (SEC) LIST		
Course Code	**SEC**	**Paper Name**
BSCS503	SEC	Data Mining
BSCS603	SEC	Digital Marketing

Generic Elective Courses (GE) List		
Course Code	**GE**	**Paper Name**
BSCS214	GE1	Discrete Structures
BSCS215	GE1	Cyber Ethics
BSCS216	GE1	Numerical Techniques
BSCS217	GE1	Principle of Management
BSCS314	GE2	Human Values & Ethics
BSCS315	GE2	Organizational Behavior

Ability-Enhancement Compulsory Course (AECC) LIST		
Course Code	**SEC**	**Paper Name**
BSCS104	AECC	Industrial Applications
BSCS518	AECC	Summer Internship

Program Outcomes (POs)		
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design / development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles, responsibility and norms of the engineering practice
PO9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

PO11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. Manage projects in multi-disciplinary environments
PO12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change..

BSCS101: Computer Fundamentals& Programming using C						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	**Examination Scheme:**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Pre-requisites: Fundamentals of IT, Boolean Algebra, Number System and basic mathematical formulas

Course Objectives:

1. To introduce the fundamental concepts of computer systems, including hardware, software, and data representation.
2. To develop an understanding of the structured programming approach and problem-solving strategies.
3. To enable students to write, debug, and execute programs in the C programming language using various control structures, functions, and data types.
4. To provide knowledge on advanced C programming concepts such as arrays, pointers, structures, and file handling for real-world applications.

Detailed Syllabus:

Unit-1:

Introduction to Computer Fundamentals: Introduction to Computer, Block Diagram of Computer, Generation of Computers, Classifications of computers, Computer Memory, Input and Output Devices. Computer Virus, Types of Viruses, Computer languages: Machine, Assembly and High-level language, Assembler, Compiler and interpreter, Algorithms and flow chart.

Number System: Binary, Octal, Decimal, and Hexadecimal representation of Characters: ASCII and EBDIC codes.

Unit-2:

MS-Word: Starting Word, new documents, aligning, underlining, and justifying text. Tables – creation, adding rows and columns, Borders. Saving, closing, Adding headers and footers.

MS-Excel: Introduction, Starting MS-Excel, MS-Excel Screen and Its Components, Elementary Working with MS-Excel.

MS-Power Point: Introduction, Starting MS-PowerPoint, Basic concept of presentation software. Standard toolbar, formatting toolbar, and drawing toolbars in Power Point and their use. Creating and opening a presentation.

Unit-3:

Overview of C Programming: History of C and standardization of C, Importance of C, Basic Structure of a C Program. Constants, Variables & Data Types: Keywords & Identifiers, Data types in C, Constants, and Variable.

Operators & Expressions: Arithmetic operators, Relational Operators, Logical operators, Increment and decrement operators, Bitwise Operators, Assignment operators, Conditional Operators, Special Operators, Ternary (? :) Operator, Operator Precedence, Operator Associativity.

Control Statements: Decision making with 'if statement', if…else statement, Nested if …else statement, Else …if ladder, switch statement.

Unit-4:

Control structures & Loops: if, if-else, if-else ladder, nesting of if, break, continue, Switch statement, use of break and default with switch, goto, exit. Types of loops. Programs

Unit-5:

Array, Structure and Union: Introductions to Arrays, and Union. Operations on Array, Sorting (Selection, Bubble, Insertion), Searching (Linear, Binary), Multidimensional arrays, Pointers and arrays, Pointer and 2-d arrays, Pointer to an array, Array of Pointers, Dynamic memory allocation. Structure declaration, Operations on Structure, Nesting of structures, Array of structure, differentiate between array & structure, passing structure to function, passing array of structure to function, Structure pointer, Union, Basic operation on Union.

Unit-6:

Functions and Macros: Function declaration, definition, calling, types of function, return statement, function calling methods, Storage Classes, Recursion. Macro, Macro Declaration, nesting of macros, Macros with argument, Differences between macro & function.

Text and Reference Books:

1. Computer Fundamentals, P.K. Sinha, BPB Publication, November, 2004.
2. Computer Fundamental and Concepts, V. Raja Raman, PHI, 4 th Edition, January 2010.
3. Go! With Microsoft Office 2010, Shelly Gaskin et.al., Volume 1, 2nd Edition
4. Gottfried - Programming with C Schaum
5. Kanetkar Y. - Let us C
6. Balaguruswamy - Programming in C

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic components of a computer system and explain the working of input, output, and memory devices.
CO2: Illustrate the fundamental concepts of programming and develop algorithms to solve simple computational problems.
CO3: Apply knowledge of C programming constructs such as data types, operators, control structures, and arrays to implement programs efficiently.
CO4: Design and implement modular programs using functions, recursion, and user-defined data types like structures and unions.
CO5: Develop programs that perform file handling operations and demonstrate understanding of pointers for dynamic memory management.

BSCS102 Digital Electronics and Applications

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	Examination Scheme:
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: - Basic knowledge of Physics of 10+2 standard.

Course Objectives:

1. To provide a solid foundation in the principles and techniques of digital electronics, including number systems, logic gates, and Boolean algebra.
2. To develop the ability to design and analyze combinational and sequential logic circuits used in digital systems.
3. To introduce the concepts and applications of flip-flops, counters, registers, and memory devices in digital circuit design.
4. To familiarize students with the practical applications of digital electronics in computers, communication systems, and embedded systems.

Detailed Syllabus:

UNIT 1: **Introduction-** Digital versus Analog Signals, Electrical versus Electronics. **Number System and Codes -** Concept of number system bases – binary, octal, decimal and hexadecimal number systems and conversion between each, BCD, Excess-3, Gray Code, and Weighted Codes.
UNIT- II: **Binary Arithmetic-** Binary Addition and Subtraction. Complements and Subtraction using complements, Multiplication. **Boolean Algebra-** Truth table, Boolean operators and precedence, Boolean laws, De-Morgan's Theorem, Principle of Duality, SOP and POS, Conversion from SOP to POS and vice versa, Canonical and standard forms. Reduction of expressions using Boolean laws and K-Map.
UNIT- III: **Logic Gates-** Primary and Secondary Logic Gates, Designing of circuits using gates, Universal Gates, Implementation of circuits using NAND and NOR.
UNIT- IV: **Combinational Circuits-** Half and Full Adder/Subtractor, Look-Ahead Carry Adder, Multiplexer, Demultiplexer, Encoder, Decoder and code-converter. Implementation using MUX and decoder.
UNIT- V: **Sequential Circuits-** Latch, Flip-flop, Edge triggered flip-flop, RS flip-flop, J-K flip-flop D-type flip-flop, T flip-flop Excitation table and characteristic equation of flip-flops, Counters.
UNIT- VI: **Memory-** General Memory Operation, ROM, RAM (Static and Dynamic), PROM, EPROM, EEPROM.

Text and Reference Books:

1. Digital Logic & computer Design, M. Morris Mano, PHI, 2004.
2. Computer System Architecture, M. Morris Mano, PHI, 2004.
3. Computer Organization, Hamachar, Vranesic, McGrawHill, 5th Edition.
4. Computer Organization & Architecture, W. Stallings, PHI, 6th Edition.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand and apply the fundamentals of number systems, binary arithmetic, and Boolean algebra in digital circuit design.
CO2: Analyze and design basic combinational logic circuits such as adders, multiplexers, decoders, and comparators.
CO3: Design and evaluate sequential logic circuits including flip-flops, counters, and shift registers.
CO4: Explain the working and applications of various memory devices and programmable logic devices (PLDs).
CO5: Demonstrate the practical applications of digital electronics in real-world systems such as microprocessors, digital communication, and embedded systems.

BCA103: Graph Theory

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	Examination Scheme:
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite:

1. Basic Knowledge of Discrete Mathematics
2. Analytical and Logical Thinking Skills

Course Objectives:

1. To introduce the fundamental concepts of graph theory and its terminologies.
2. To develop the ability to model real-world problems using graphs.
3. To study various graph algorithms and their applications in computer science.
4. To enhance logical reasoning and problem-solving skills through graph-based problem analysis.

Detailed Syllabus:

Unit-1: **Introduction to Graphs:** Definition and types of graphs (simple, multigraph, pseudograph), degree, order, and size, special graphs (complete, regular, bipartite, cycle, wheel), Applications of graphs.
Unit-2: **Graph Representation & Connectivity:** Adjacency matrix, incidence matrix, adjacency list. Graph isomorphism. Walk, path, cycle. Connected and disconnected graphs. Eulerian and Hamiltonian paths and circuits.
Unit-3: **Planar Graphs and Coloring:** Planar graphs and Euler's formula (basic), graph coloring, chromatic number, Four Color Theorem (conceptual), applications in scheduling and map coloring. **Graph Traversal & Shortest Path**: BFS and DFS with examples. Shortest path: Dijkstra's algorithm.
Unit 4: **Trees and Spanning Trees**: Definition and properties of trees, rooted trees, binary trees, tree traversal techniques (infix, prefix, postfix), spanning trees, Minimum Spanning Tree Algorithms: Kruskal's, Prim's.
Unit 5: **Directed graphs:** Definitions, degree concepts (in-degree, out-degree), Directed paths and cycles, Strongly connected components, condensation graphs, Directed Acyclic Graphs (DAGs) and their applications, Topological sorting algorithms, Max-Flow Min-Cut Theorem
Unit 6: **Bipartite graphs:** Characterization, matching, vertex cover **Algorithms:** BFS, DFS, Dijkstra's, Bellman-Ford, Floyd-Warshall.

Text books:

1. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice-Hall of India, 2004.
2. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 7th Edition, McGraw Hill Education, 2017.
3. Seymour Lipschutz and Marc Lipson, Schaum's Outline of Discrete Mathematics, McGraw-Hill Education, 3rd Edition, 2009.

Reference Books:

1. J. A. Bondy and U. S. R. Murty, Graph Theory with Applications, North Holland, 1982.
2. Chartrand, Gary, and Ping Zhang, Introduction to Graph Theory, McGraw-Hill, 2004.
3. Frank Harary, Graph Theory, Addison-Wesley, 1969.
4. R. Balakrishnan and K. Ranganathan, A Textbook of Graph Theory, Springer, 2nd Edition, 2012.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts and terminologies of graph theory, including types of graphs, degrees, and subgraphs.
CO2: Apply graph traversal algorithms such as BFS and DFS to solve connectivity and path-related problems.
CO3: Analyze and solve problems involving trees, spanning trees, and shortest path algorithms like Dijkstra's and Kruskal's.
CO4: Model real-world problems using graphs and apply appropriate graph-theoretic techniques for their solutions.
CO5: Demonstrate the ability to solve problems related to graph coloring, planarity, and network flows.

BSCS104 Industrial Applications

L	T	P	Theory	Internal	Total Marks
Hours					
1	1	0	35	15	50

Teaching Scheme:	Examination Scheme:
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite: - English Grammar of 10+2 standard.

Course Objectives:

The objectives of this course are:

1. To introduce students to the fundamental concepts and practices involved in various industrial sectors, including manufacturing, automation, and process control.
2. To develop an understanding of the integration of technology, machinery, and systems used in industrial operations to improve productivity and quality.
3. To familiarize students with the application of engineering principles, safety standards, and environmental considerations in industrial settings.
4. To enhance students' ability to analyze real-world industrial problems and propose effective, sustainable, and innovative solutions.

Detailed Syllabus:

Unit-1: **Communication Skills:** Verbal, Non-Verbal, Listening Skills, Writing Skills, Questioning Skills **Business Etiquette:** Making the First Impression, Importance of Handshakes, Business Card Etiquette, Grooming and Personal Hygiene, Body Language, Telephone and email Etiquette
Unit-2: **Presentation Skills:** Fundamentals of an Effective Presentation, 5 Ps of an Effective Presentation, Importance of Visual Aids, Understanding and Overcoming Fear of Public Speaking, Importance of Managing Voice and Language, Managing Question and Answer Session
Unit-3: **Interpersonal and Team Skills:** Initiating Small Talks, Managing Relationships, Understanding the Cultural Diversity, Teambuilding Process and Techniques, Coordination in Teams, Assertive Communication while Dealing with Teams, Balancing Team Needs and Individual Needs, Importance of Feedback in Team Building **Conflict Management:** Conflict Resolution Strategies, Tools and Techniques for Conflict Management.
Unit-4: **Facing Interview:** Preparing to face interviews, Group Discussion, Resume Building, Role of Attitude: Positive mental attitude, Career Planning, Goal Setting: Establishing SMART Goals, Importance of Mission Statement, Formulation of Goals, understanding and overcoming Procrastination.

Text and Reference Books:

1. Business Communication, Bovee & Thill, McGraw Hill, fifth edition, 2007.
2. Business Communication, Raymond V. Lesikar, McGraw Hill, 7th edition, 2009.
3. Soft Skills, Dr.K.Alex, S.Chand 8. Basic English Usage, Michael Swan, Oxford Indian Edition.
4. Business Communication, K.K. Sinha, Galgotia Publications.
5. Effective Speaking, Comfort, Jeremy, Cambridge University Press, 2002.
6. Essentials of Business Communication, Rajendra Pal, J.S. Korlahalli Sultans, Chand and Sons Company.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand and explain the role of industrial processes, technologies, and systems in different sectors such as manufacturing, energy, automation, and logistics.
CO2: Apply basic engineering and scientific principles to analyze and solve problems related to real-world industrial applications.
CO3: Demonstrate the ability to work with industrial tools, machines, or software systems commonly used in factory and plant operations.
CO4: Evaluate the impact of industrial practices on safety, productivity, quality control, and environmental sustainability.
CO5: Collaborate effectively in team-based projects or case studies, simulating industrial scenarios to develop innovative and efficient solutions.
CO1: Understand and explain the role of industrial processes, technologies, and systems in different sectors such as manufacturing, energy, automation, and logistics.

BSCS201: Data Structures Using C

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	Examination Scheme:
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: -

1. Familiarity with the fundamentals of C or other programming language
2. A solid background in mathematics, including probability, set theory

Course Objectives:

1. To introduce the fundamental concepts of data structures and their importance in solving computational problems efficiently.
2. To develop the ability to implement various linear and nonlinear data structures using object-oriented programming principles in C++.
3. To enable students to analyze the time and space complexity of algorithms related to data storage, retrieval, and manipulation.
4. To prepare students to apply appropriate data structures in software development and real-world problem-solving scenarios.

Detailed Syllabus:

UNIT I (10 Hours): **Introduction Data Structure:** Introduction to Data Structure, Classification of data Structure, Operation on data structure, Top down and Bottom-up approaches to algorithm, Analysis of algorithm, Frequency count, Complexity measures in terms of time and space.
UNIT II (10 Hours): **Arrays:** Representation of array (single &multi-dimensional arrays), Traversing, insertion and deletion operations. Merging, matrix addition, subtraction, multiplication, transpose, sparse matrix
UNIT III (10 Hours): **Stacks:** Introduction to stack, primitive operation on stack, Stacks application: Infix, post fix, Prefix and Recursion. **Queues:** Introduction to queues, Primitive Operations on the Queues, Circular queue, Dequeue, Priority queue, Applications of queue.
UNIT IV (10 Hours) : **Linked List:** Introduction to the Linked List, Basic operations on linked list, Header nodes, Doubly Linked List, Circular Linked List, and Application of Linked List.
UNIT V (6 Hours) : **Trees**: Basic Terminology, Binary Trees, Tree Representations using Array & Linked List, Basic operation on Binary tree, Traversal of binary trees: - In order, Preorder & post order, Application of Binary tree, threaded binary tree, Heap Tree-tree & Height balanced tree.

UNIT VI (10 Hours) :

Searching and Sorting: Sequential search & binary search, Hashing, sorting method (Insertion sort, Selection sort, Bubble sort, Quick sort, Merge sort, Heap sort).

Text and Reference Books:

1. Data Structures and Program Design in C, R.L. Kruse, B.P. Leung and C. L. Tondo, PHI, 2008.
2. Data Structures, Seymour Lipscutz,Mcgraw Hill Publication, 2009
3. Data structures using C, Aaron M.Tenanbaum, Pearson education, 2004.
4. Data structure through C, Yashvant Kanetkar, BPB Publication, 2006.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts of data structures and object-oriented programming principles using C++.
CO2: Implement and manipulate linear data structures such as arrays, linked lists, stacks, and queues using C++.
CO3: Apply appropriate non-linear data structures like trees and graphs to solve computational problems efficiently.
CO4: Analyze the performance of algorithms in terms of time and space complexity for different data structure operations.
CO5: Design and develop C++ programs that use appropriate data structures for real-world problem-solving and software development.

BSCS202: Programming in C++

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	Examination Scheme:
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Basics of c language

Course Objectives:

1. To introduce the fundamentals of object-oriented programming and its differences from procedural programming.
2. To develop the ability to write efficient C++ programs using concepts such as classes, objects, inheritance, polymorphism, and encapsulation.
3. To familiarize students with advanced C++ features such as constructors, destructors, operator overloading, templates, and exception handling.
4. To enable students to apply C++ programming skills to solve real-world problems and develop modular, reusable, and maintainable code.

Detailed Syllabus:

UNIT I: **Introduction to OOP:** Basic concepts of OOPs, Advantages of OOP, Need of object-oriented programming, characteristics of object-oriented languages, Object oriented approach vs procedure-oriented approach, Object, Classes, Encapsulation, Data Abstraction, Inheritance, Polymorphism, Dynamic binding, Message Passing, Application of OOPs.
UNIT II: **C++ Programming Basics:** Language Fundamentals-Character set, Keywords, Identifiers, Variables, Constant, Data Types, and Comments. Operators in C++, Operator Precedence - Types of operators, Precedence and Associativity. Type Conversion, Statement and types of statements. Difference between C++ and C. Basic program construction, input/output using cin/count; manipulators
UNIT III: **Control Statements:** Conditional expressions, loop statements, breaking and control statements. Arrays-Notation, Declaration, Initialization, Processing.
UNIT IV: **Functions:** Simple functions, Function Prototyping, Call by reference, Return by Reference, Default Arguments, Constant Arguments, Inline Function, functions overloading, static function.
UNIT V : **Classes and Objects:** Introduction, structure and classes, declaration of class, defining the object of a class, accessing a member of class, arrays of class objects, Constructors, Destructors, friend function, Dynamic memory allocation. Constructors and Destructors, objects as function arguments, static class member.

UNIT VI:

Inheritance: Introduction, defining derived classes, overriding member functions, Single Inheritance, multilevel Inheritance, multiple Inheritance, Hierarchical Inheritance, Virtual Base Class. Operator Overloading: Overloading Unary & Binary operators, Data conversion.

Text and Reference Books:

1. Object Oriented Programming with C++, E. Balaguruswamy, 4th Edition.
2. Object Oriented Programming in C++, Robert Lafore, Sams, Dec., 2001.
3. C++ Programming, D. Ravichandran, TMH, 2nd Edition, Dec. 2002.
4. Mastering C++, Venugopal, TMH, September, 1997.
5. Object Oriented Programming using C++ , Joyce Farrell, Cengage Learning India Pvt. Ltd., 6th Edition.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the principles of object-oriented programming and the features of the C++ language.
CO2: Develop C++ programs using classes, objects, constructors, destructors, and function overloading.
CO3: Apply object-oriented concepts such as inheritance, polymorphism, and encapsulation to design efficient programs.
CO4: Implement advanced C++ features such as operator overloading, templates, file handling, and exception handling.
CO5: Design and develop modular, reusable, and maintainable C++ programs for real-world problem-solving applications.

BSCS203: Operating Systems

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	Examination Scheme:
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite: - DOS, Microprocessor peripherals and interfacing

Course Objectives:

1. Define and list the functions of an operating system.
2. list resources involved in process creation and management.
3. Explain the use of paging and segmentation
4. Explain the function and structure of the I/O system.
5. Describe path names and directory structure visible to end users

Detailed Syllabus:

Unit-1: **Introduction:** Operating System, Simple Batch Systems, Multi programmed Batched Systems, Timesharing Systems, Real-Time Systems, System Components, Operating System Services & Functions.
Unit-2: **Process:** Process Concept, Process Scheduling, CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms with examples.
Unit-3: **Process Communication and Synchronization:** Co-operating Process, Inter-process communication, Threads (Thread Concept, Single and Multiple Threads, Benefits). Introduction to process synchronization, Critical Section Problem.
Unit-4: **Deadlock:** Deadlock Introduction, Deadlock Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.
Unit-5: **Memory Management:** Logical versus Physical Address Space, Swapping, Contiguous Allocation (Memory Allocation, Fragmentation), Paging (Basic Method, Hardware Support), Segmentation (Basic Method, Hardware). **Virtual Memory:** Demand Paging, Page Replacement, Page Replacement Algorithms.
Unit-6: **File System:** File Concept, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management, Protection of File System. Input/output Management. Linux Case Study.

Text and Reference Books:

1. Operating System concepts, A. Silberschatz, Peter B. Galvin, Addison Wesley publishing Company, 6th Edition
2.UNIX shell programming By Yashvant Kanetkar ---BPB Publications
3.UNIX Concepts and Application By Sumitabha Das--- Tata McGraw-Hill publication
4.The C Odyssey UNIX the open boundless C By Meeta Gandhi--- BPB Publications

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic concepts, functions, and types of operating systems, including system components and services.
CO2: Analyze process management techniques including process scheduling, creation, synchronization, and inter-process communication.
CO3: Apply concepts of memory management such as paging, segmentation, and virtual memory.
CO4: Understand and evaluate file systems, file access methods, and disk scheduling algorithms.
CO5: Demonstrate knowledge of deadlock detection, prevention, and recovery techniques in multi-process environments.

BSCS214 (GE): Discrete Structures

L	T	P	Theory	Internal	Total Marks
Hours					
1	1	0	35	15	50

Teaching Scheme:	Examination Scheme:
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite:

1. Basic Knowledge of Set Theory and Logic.
2. Analytical and Problem-Solving Skills.

Course Objectives:

1. To introduce the fundamental concepts of discrete mathematics.
2. To develop the ability to apply mathematical reasoning.
3. To familiarize students with combinatorics, recurrence relations, and graph theory.
4. To enhance problem-solving skills through topics such as trees, lattices, and algebraic structures.

Detailed Syllabus:

Unit-1: **Set Theory:** Introduction of sets, Subsets, Proper Subset, Disjoint Set, Power Set, General identities on sets, Set Operations, Venn-Diagram, Principle of Inclusion and Exclusion. **Relations:** Definition, Operations on relations, Composite Relations, Properties of relations, Equality of relations, Order of relations. **Functions:** Definition, Classification of functions, Operations on functions.
Unit-2: **Propositional Logic:** Proposition, well-formed formula, Truth tables, Tautology, Satisfiability, Contradiction, **Predicate Logic:** First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic
Unit-3: **Trees:** Definition, Binary tree, Binary tree traversal, Binary search tree. **Graphs:** Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs,

Suggested Readings:

1. Liu and Mohapatra, “Elements of Distcrete Mathematics”, McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
4. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand and apply the principles of logic, truth tables, and predicate calculus in computational problem solving.
CO2: Analyze and construct set operations, relations, and functions with applications in database theory and programming.
CO3: Apply combinatorial techniques, permutations, and combinations to solve counting and probability problems.
CO4: Solve recurrence relations and apply mathematical induction in analyzing algorithm performance and recursive programs.
CO5: Understand and utilize graph theory and tree structures in the design and analysis of networks and hierarchical data models.

BSCS215 (GE): Cyber Ethics

L	T	P	Theory	Internal	Total Marks
Hours					
1	1	0	35	15	50

Teaching Scheme	Examination Scheme
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite: Boolean algebra, Number System and basic mathematical formulas

Course Objectives:

1. Gain a foundational understanding of key information security concepts like confidentiality, integrity, and availability.
2. Identify common security threats and vulnerabilities, and learn strategies to mitigate risks.
3. Understand the principles of cryptography, including encryption, decryption, and digital signatures.
4. Apply basic security measures and practices to protect network and application systems.
5. Recognize the importance of security policies and legal regulations, and learn to develop and implement compliant security policies.

Detailed Syllabus:

UNIT I (8 Hours) : **Introduction of Information Security:** Information Security, Security Goals (Confidentiality, Integrity, Availability), Common Threats (Viruses, Phishing, Hackers), Importance of Protecting Information, Data Breaches, Risk Assessment, Vulnerabilities, Basics of Risk Management.
UNIT II (10 Hours): **Overview of Computer security:** Computer Security Concepts, Computer Security, Information Security, Network Security, Threats, Attacks and Assets, Security Requirements, Security Design Principles, Attack Surfaces and Attack Trees, Computer Security Strategy**.**
UNIT III (10 Hours): **Malicious Software and Intrusion:** Malicious Software, Virus and its phases, Virus Classification, Worm, Worm Propagation Model, State of Worm Technology, Trojan Horse, Intrusion and Intruders, Intrusion Detection System, Analysis Approaches: Anomaly Based, Signature Based, Honeypots.

Text and Reference Books:

1. Information Systems Security: Security Management, Metrics, Frameworks And Best Practices - Nina Godbole, ISC2 Press, 2010
2. Mark Stamp's Information Security: Principles and Practice (WIND) Paperback – 2009 by Deven N. Shah, Wiley (2009)
3. Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerbach, 2012
4. Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)

Cyber Security by Nina Godbole, SUnitBelapure, Wiley, 2011

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic concepts of information security, including threats, vulnerabilities, and risk management principles.
CO2: Identify and analyze different types of cyber-attacks, malware, and intrusion techniques.
CO3: Apply knowledge of cryptographic techniques for securing data and communication.
CO4: Explain the importance of access control, authentication, and authorization in securing information systems.
CO5: Understand legal, ethical, and organizational aspects of information security, including security policies and compliance standards.

BSCS216 (GE): Numerical Techniques

L	T	P	Theory	Internal	Total Marks
Hours					
1	1	0	35	15	50

Teaching Scheme:	Examination Scheme:
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite:

1. Elementary Mathematics
2. Fundamentals of Programming

Course Objectives:

1. To introduce the fundamental concepts and methods of numerical analysis.
2. To develop the ability to apply numerical techniques.
3. To provide an understanding of basic statistical concepts and measures.
4. To enable students to analyse and interpret data.

Detailed Syllabus:

Unit-1: Transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method.
Unit-2: Interpolation-Finite differences, difference tables, Newton's forward and backward interpolation formulae, Lagrange's and Newton's Divided difference formulae for unequal intervals.
Unit-3: Gauss's interpolation formula, Stirling's formula, Bessel's formula, Laplace-Everett formula. Numerical Differentiation and Integration, Newton- Cote's quadrature formula, Trapezoidal Rule, Simpson's $1/3^{rd}$ Rule, Simpson's $3/8^{th}$ Rule.

Text and Reference Books:

1. Numerical Methods for Scientific Engineering Computation, Jain, Iyenger & Jian, New Age International , New Delhi, 2003.
2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 2006.
3. Advanced Engineering Mathematics, E. Kreysig, John Wiley & Sons, 2005.
4. An Introduction to Numerical Analysis, Devi Prasad, Narosa Publication House, 3rd Edition.

Course Outcomes:

After completing the course, students will be able to:

CO1: Apply numerical methods such as bisection, Newton-Raphson, and iteration techniques to solve algebraic and transcendental equations.
CO2: Use interpolation and numerical differentiation techniques to estimate values and analyze functions from discrete data points.
CO3: Solve problems involving numerical integration using methods like Trapezoidal and Simpson's rules.
CO4: Compute and interpret basic statistical measures such as mean, median, mode, variance, and standard deviation.
CO5: Analyze datasets using correlation, regression, and probability distributions to support data-driven decision-making.

BSCS217 (GE): Principles of Management

L	T	P	Theory	Internal	Total Marks
Hours					
1	1	0	35	15	50

Teaching Scheme:	Examination Scheme:
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite: - Fundamental of Managerial skills.

Course Objectives:

1. To introduce the fundamental concepts, theories, and functions of management and their application in organizational settings.
2. To develop an understanding of the roles and responsibilities of managers in planning, organizing, leading, and controlling business activities.
3. To familiarize students with the evolution of management thought and the contributions of major management thinkers.
4. To equip students with the skills necessary for effective decision-making, strategic planning, leadership, and organizational communication.

Detailed Syllabus:

Unit-1:

Management: - Concept, Nature, Scope & Importance. Management: Art and Science, As a Profession, Management Vs Administration Management Skills, Managerial Roles & Levels of Management.

Evolution & Development of Management Thought: Contribution of Taylor, Fayol & Weber Social System and Decision Theory Approach.

Unit-2:

Planning: Nature, Scope & Objectives; Types of plans; planning process; Business forecasting &Planning Premises; MBO: Concept & Process. Techniques & Process of decision-making.

Organizing: Concept, Importance and Principles, and Process of Organizing. Formal & Informal Organizational Structure, Departmentation Span of Control, Delegation of Authority, Authority & Responsibility, Centralization and Decentralization.

Unit-3:

Staffing: Concept, Manpower Planning, Job Analysis, Recruitment & Selection, Training & Development.

Directing: Concept, Importance, Direction & Supervision, Role of Supervisor, Techniques of directing. Nature and Scope of Co-ordination, Principles, Techniques and Barriers to Co-ordination.

Text and Reference Books:

1. Essentials of Management, Harold Koontz, Heinz Weihrich, Tata McGraw-Hill, 1998.
2. Essentials of Management, Joseph L. Massie, Prentice Hall of India, Pearson, 4th Edition, 2003
3. Management, Stoner, Freeman, Gilbert, Pearsons, 6TH Edition.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand and explain the fundamental principles, functions, and processes of management in organizational contexts.
CO2: Analyze various management theories and apply them to real-world business scenarios.
CO3: Demonstrate the ability to plan, organize, lead, and control business operations effectively.
CO4: Evaluate the roles of leadership, motivation, and communication in enhancing managerial performance and team productivity.
CO5: Apply strategic decision-making and problem-solving techniques in managing organizational resources efficiently.

BSCS301: Database Management Systems

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
3	1	4	70	30	4	100

Teaching Scheme	Examination Scheme
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Computer Organization, Operating System, Data Structure, Mathematics

Course Objectives:

1. Understanding values of Data,
2. significant role of DBMS, normalizing a Database,
3. problems with unnecessary duplication of data, transaction, concurrent transactions

Detailed Syllabus:

Unit-1:
Introduction to Database System: DBMS Definition, Characteristics of DBMS, Application and advantages of DBMS, Instances, Schemas and Database States, Three Levels of Architecture, Data Independence, DBMS languages, Data Dictionary, Database Users, Data Administrators.

Unit-2:
Data Models: Data Models, types and their comparison, Entity Relationship Model, Entity Types, Entity Sets, Attributes and its types, Keys, E-R Diagram, Data Integrity, RDBMS: Concept, Components and Codd's rules.

Unit-3:
Relational Databases: Introduction to Relational Databases and Terminology-Relation, Tuple, Attribute, Cardinality, Degree, Domain. Keys, Super Key, Candidate Key, Primary Key, Foreign Key, Relational Algebra. Operations, Select, Project, Union, Difference, Intersection Cartesian product, Join, Natural Join.

Unit-4:
Structured Query Language (SQL): Introduction to SQL, History of SQL, Basic Structure, DDL Commands, DML Commands, TCL Commands, Simple Queries, Nested Queries, Join queries, semi-join queries, self-join. Aggregate Functions and Clauses.

Unit-5:
Relational Database Design: Introduction to Relational Database Design, DBMS vs RDBMS.

Unit-6:
Normalization: Anomalies of un-normalized database, Need of Normalization, Normal Forms-1NF, 2NF, 3NF, BCNF and functional dependency.

Text and Reference Books:

1. 1. Database System Concepts, Henry Korth , A. Silberschatz, 5th Edition, 2005.
2. An Introduction to Database System, Bipin Desai, Galgotia Publications, 1991.
3. SQL, PL/SQL the Programming Language of Oracle, Ivan Bayross, BPB Publications, 4th Edition.
4. Schaum's Outline of "Fundamental of Relational Databases", Ramon A. Mata, Pauline K. Cushman, McGraw Hill, December, 2006.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts of database systems, data models, and database architecture to design efficient data storage solutions.
CO2: Apply Entity-Relationship (ER) modeling to design relational databases and convert ER diagrams into normalized relational schemas.
CO3: Construct and execute queries using Structured Query Language (SQL) to manipulate and retrieve data effectively.
CO4: Analyze and apply normalization techniques and functional dependencies to optimize database design and reduce data redundancy.
CO5: Understand and implement concepts of transaction management, concurrency control, and database recovery to ensure data integrity and consistency.

BSCS302: Object Oriented Programming using Java

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	Examination Scheme:
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite:

1. C programming
2. Object Oriented Programming using C++

Course Objectives:

1. To introduce the fundamental concepts of object-oriented programming (OOP) and how they are implemented in Java.
2. To develop the ability to write, compile, and debug Java programs using classes, objects, inheritance, polymorphism, and interfaces.
3. To familiarize students with Java's standard libraries, exception handling, file I/O, and multithreading capabilities.
4. To enable students to build GUI-based applications and real-world projects using Java frameworks and tools.

Detailed Syllabus :

UNIT I :

Introduction: Features of the Java Language, Platform Independency, JVM, Byte-code, Operator, Data type, Variables, Robustness.

OOPS: Object, Class, Classifications, Methods & classes, Inheritance, Static and non-Static methods, Overloading, Overriding of methods, Abstraction, Interface, Polymorphism.

UNIT II :

Packages: Data Encapsulation, Concept of Package, creating package, Importing packages, Child Packages.

Exception Handling: Exceptions & Errors, Types of Exception, Control Flow in Exceptions, Use of the try, catch, finally, throw, throws in Exception Handling. In-built and User Defined Exceptions, Checked and Unchecked Exceptions.

UNIT III :

I/O, String Handling: Operation on String, Mutable & Immutable String, tokenizing a String, Creating Strings using String Buffer.

I/O and File Handling: Bufferedreader class, InputStreamReader class, Scanner class, Creating File, Finding File Reading and Writing File (Doc File, Html File, a Text File).

Array and Loop: Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array and Control Statements.

UNIT IV (10 Hours): **Multi-Threading:** Understanding Threads, Needs of Multi-Threaded Programming, Solution of Producer consumer problem by Multi Thread, Thread Life-Cycle, Thread Priorities, Synchronization of Thread. **Java Networking:** Concept of client and Server, Introduction of TCP, Concept of Socket, Importance of Socket, Socket programming, communication between client and server.
UNIT V : **GUI Application Development:** Introduction to AWT, AWT controls Java Applet, Layout Managers, Menus, Images, Graphics, Event Handling, Swing, Containers, Panes, Frames, Dialogue boxes, working with image controls.
UNIT VI : **JDBC:** The connectivity Model, JDBC/ODBC Bridge, Java, SQL package, connectivity to remote database, navigating through multiple rows retrieved from a table/ multiple tables of a database.

Text and Reference Books:

1. The Complete Reference Internet, Margaret Levine Young, TMH, 1999.
2. The Complete Reference JAVA 2, Naughton Schildt, TMH, 5th Edition.
3. Programming in JAVA, E. Balagurusamy E, TMH, 3rd Edition, 2006.
4. Java Black book, Steven Helzner, Dreamtech , 2002

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts of object-oriented programming using Java.
CO2: Apply Java programming constructs such as classes, objects, inheritance, and polymorphism to solve real-world problems.
CO3: Develop Java applications using packages, interfaces, exception handling, and multithreading.
CO4: Implement GUI-based applications using AWT and Swing components.
CO5: Use Java for database connectivity (JDBC) and develop simple client-server applications.

BSCS303: Software Engineering

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	Examination Scheme:
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite:

1. Basic Knowledge of Programming Languages.
2. Fundamentals of Computer Science.

Course Objectives:

1. To introduce the fundamental concepts and principles of software engineering.
2. To enable students to analyze user requirements.
3. To impart knowledge of software design, coding, testing, and maintenance techniques.
4. To promote understanding of project management practices, quality assurance, and software documentation.

Detailed Syllabus:

Unit-1: **Introduction:** Introduction to Software Engineering, Software Characteristics, Software Engineering Processes, And Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, and Iterative Enhancement Models.
Unit-2: **Software Requirement Specifications (SRS):** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document.
Unit-3: **Software Design:** Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Coupling and Cohesion, Top-Down and Bottom-Up Design Strategies: Function Oriented Design, Object Oriented Design.
Unit-4: **Software Testing:** Testing Objectives, Test Data Suit Preparation, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Top-Down and Bottom-Up testing. White Box Testing, Black Box Testing, Alpha and Beta Testing of Products. Formal Technical Reviews, Walk Through, Code Inspection, Compliance with Design and Coding Standards.
Unit-5: **Software Maintenance:** Need for Maintenance, Preventive, Corrective and Perfective Maintenance Cost of Maintenance, Maintenance Models.

Unit-6:

Software Project Management: Estimation of Various Parameters such as Size, Cost, Efforts, Schedule/Duration, Constructive Cost Model (COCOMO), Resource Allocation Models, Software Risk Analysis and Management, Software Quality Attributes and Factors Software Configuration Management, CASE Tools.

Text and Reference Books:

1. Software Engineering: A Practitioners Approach, R. S. Pressman, McGraw Hill, 6th Edition.
2. Fundamentals of Software Engineering, Rajib Mall, PHI Publication, 2nd Edition.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers, 3rd Edition.
4. Software Engineering, Pankaj Jalote, Wiley, 5th Edition.
5. Ian Sommerville, Software Engineering, Addison Wesley, 7th Edition

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the software development life cycle (SDLC) models and apply them to develop structured software solutions.

CO2: Analyze user requirements and design functional and non-functional specifications for software systems.

CO3: Apply principles of software design, coding, and modularization to build maintainable and efficient software applications.

CO4: Demonstrate the use of testing techniques and quality assurance practices to ensure software reliability and performance.

CO5: Utilize project management and documentation tools to plan, execute, and deliver software projects effectively within scope and constraints.

BSCS314 (GE): Human Value and Ethics

L	T	P	Theory	Internal	Total Marks
Hours					
1	1	0	35	15	50

Teaching Scheme:	Examination Scheme:
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite: Basics of morals, values and ethics.

Course Objectives:

1. To impart knowledge of ethical theories and human values essential for personal and professional development.
2. To develop an understanding of the importance of integrity, empathy, compassion, and responsibility in personal and social life.
3. To encourage students to apply ethical principles in decision-making, behavior, and interaction within society and the workplace.
4. To create awareness about global and cultural ethics, sustainability, and the role of individuals in promoting a just and value-based society.

Detailed Syllabus:

Unit-1 :

Theories and evolution of mankind, Culture and civilization, Basic characteristics of a good human being, Life management, Concept of dharma and human values, Spiritual quotient, social quotient and emotional-quotient.

Role of human values in the success of individuals and business organizations, Concept of human relations and human face of the management, social health and management of emotions.

Unit-2 :

Concepts of happiness and prosperity, Sukh, Suvidha and swasthya. Basic elements and dimensions of happiness. Teachings of holy books- Geeta, Bible, Kuran, Guru Granth Saheb etc.

Concept of ethical consciousness in business. Need and importance of business ethics in marketing. Consumer protection.

Unit-3 :

Comparison of Indian and western view of ethics and values. Secular ethics. Cases/ National and International.

Text and Reference Books :

1. Ethics in Engineering, Mike Martin and Roland Schinzinger, McGraw-Hill, New York 1996.
2. Engineering Ethics, Govindarajan M., Natarajan S, Senthil Kumar V. S, PHI, 2004.
3. Engineering Ethic, Charles D. Fleddermann, Pearson Education / SPrentice Hall, New Jersey, 2004.
4. Engineering Ethics-Concepts and Cases, Charles E Harris, Michael S. Protchard, Michael J Rabins, Wadsworth Thompson Learning, United States, 2000

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the significance of human values and ethical principles in personal, academic, and professional life.

CO2: Demonstrate awareness of moral responsibilities and ethical decision-making in diverse real-life situations.

CO3: Analyze various ethical dilemmas and apply suitable frameworks to resolve them effectively.

CO4: Exhibit empathy, compassion, integrity, and respect for others in interpersonal and societal interactions.

CO5: Commit to sustainable development, social responsibility, and ethical practices for the betterment of society.

BSCS315 (GE): Organizational Behavior

L	T	P	Theory	Internal	Total Marks
Hours					
1	1	0	35	15	50

Teaching Scheme:	Examination Scheme:
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite: Basic understanding of Management Principles, Fundamentals of Psychology and Sociology

Course Objectives:

1. To introduce the fundamental concepts, theories, and models related to individual and group behavior within organizations.
2. To develop an understanding of the psychological and sociological factors that influence employee motivation, performance, and satisfaction.
3. To enhance students' ability to analyze organizational culture, leadership styles, and communication patterns.
4. To equip students with skills to effectively manage teams, resolve conflicts, and contribute to positive organizational change.

Detailed Syllabus:

Unit-1: Introduction to Organizational Behavior Definition, Nature, and Importance of Organizational Behavior, Historical development and contributing disciplines (Psychology, Sociology, Anthropology), Key elements of OB: People, Structure, Technology, and Environment, Models of Organizational Behavior (Autocratic, Custodial, Supportive, Collegial), Emerging trends in OB: Diversity, Globalization, Ethics, and CSR
Unit-2 :Individual & Group Behavior in Organizations Individual Behavior: Personality – Types and Theories (MBTI, Big Five), Perception – Process, Factors, and Errors, Motivation – Maslow's, Herzberg's, McGregor's Theories, Learning – Classical and Operant Conditioning, Social Learning Theory, Attitudes and Job Satisfaction Group Behavior: Groups and Teams – Types, Formation, Group Dynamics, Communication – Process, Types, Barriers, Conflict – Causes, Types, Conflict Resolution Strategies, Leadership – Theories (Trait, Behavioral, Contingency), Styles, and Effectiveness

Unit-3 :Organizational System & Dynamics

Organizational Culture and Climate – Definition, Types, and Impact, Power and Politics in Organizations, Organizational Change – Need, Resistance, and Change Management Models (Lewin's Model, Kotter's 8-Step Model), Stress Management – Causes, Effects, and Coping Strategies, Organizational Development – Concept, Interventions, and Role of OB in Change

Contemporary issues: Work-Life Balance, Remote Work, Emotional Intelligence in Organizations

Text and Reference Books :

1. Stephen P. Robbins & Timothy A. Judge – Organizational Behavior
2. Fred Luthans – Organizational Behavior
3. K. Aswathappa – Organizational Behaviour
4. Newstrom & Davis – Organizational Behavior: Human Behavior at Work

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the foundational theories and principles of organizational behavior and their relevance to managing people in organizations.
CO2: Analyze the impact of individual personality, perception, motivation, and learning on workplace behavior and performance.
CO3: Evaluate group dynamics, team functioning, leadership styles, and communication processes in organizational settings.
CO4: Examine organizational culture, power structures, conflict resolution strategies, and their influence on organizational effectiveness.
CO5: Apply organizational behavior concepts to manage change, reduce workplace stress, and promote employee well-being and productivity.

BSCS401: Computer Graphics

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	Examination Scheme:
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Linear Algebra, Matrix, and C-Programming.

Course Objectives:

1. To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
2. To learn the basic principles of 2- dimensional and 3- dimensional computer graphics.
3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
4. Provide an understanding of mapping from a world coordinate to device coordinates, clipping, and projections.
5. To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.

Detailed Syllabus:

Unit-1:

Introduction to computer graphics: Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Color CRT, Flat panel displays, Frame buffer and video controller, interactive input and output devices.

Unit-2:

Line drawing algorithms: DDA, Bresenham.
Circle generating algorithms: Midpoint circle generating algorithm, Bresenham circle generating algorithm.
Ellipse generating algorithms: Midpoint ellipse generating algorithm, Bresenham ellipse generating algorithm.

Unit-3:

Polygon Filling: Scan line Polygon filling Algorithm, Boundary fill Algorithm, Flood fill Algorithm.
2D Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.

Unit-4:

Segment and Display files: Segments, Functions for segmenting the display file, Posting and un-posting a segment, segment naming schemes, Default error conditions, appending to segments, refresh concurrent with reconstruction, Free storage allocation, display file structure. Interactive picture construction techniques.

Unit-6:

Three Dimensional: 3-D geometric primitives, 3-D Transformation, 3-D viewing, projections, 3-D Clipping. **Curves and Surfaces:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, introductory concepts of Spline, Bezier curves and surfaces.

Suggested Readings:

1. Computer Graphics-C Version, Donald Hearn, M. Pauline Baker, Pearson Education, 2007
2. Computer graphics, Schaum's outline, TMH, 2006.
3. Computer Graphics: A Programming Approach, Steven Harrington, TMH, 1984.
4. Computer Graphics Principles and Practice, James D Foley, Pearson education 2004.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic concepts and applications of computer graphics, including various display devices and graphics standards.
CO2: Apply 2D transformation techniques such as translation, scaling, rotation, and reflection to graphical objects.
CO3: Implement line, circle, and ellipse drawing algorithms using raster scan techniques.
CO4: Understand and apply 3D transformations, viewing, and projection methods in graphics programming.
CO5: Demonstrate the use of curves, clipping algorithms, and color models in creating and manipulating graphical scenes.

BSCS402: Programming in Python

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	Examination Scheme:
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Basic computer skills, a problem-solving mindset, and familiarity with programming concepts

Course Objectives:

1. To know the basics of Programming
2. To construct Python programs with control structures.
3. To structure a Python Program as a set of functions.
4. To use Python data structures-lists, tuples, dictionaries.
5. To do input/output with files in Python.

Detailed Syllabus:

Unit-1:
Introduction to Python: Importance of Python, Installing and working with Python in Windows, Linux and Mac, Using Python as calculator, Comments, how to define main function in Python
The concept of data types - Variables, Arithmetic Operators and Expressions.

Unit-2:
Subscript Operator, Indexing, slicing a string, converting strings to numbers and vice versa, split function, **Control flow** - if statements, for and while loops, nested loops, short-circuit (lazy evaluation), range () function, break and continue statements, pass statements.

Unit-3:
Data Structures: **Lists** - Basic list operations, Replacing, inserting, removing an element; Searching and sorting a list, Methods of list objects, using lists as Stacks and Queues, how efficient lists are when used as stack or queue, List and nested list Comprehensions Tuple, Sets, Difference between list and tuple, **Dictionary** - adding and removing keys, accessing and replacing values, traversing dictionaries

Unit-4:
Python functions and modules - **OS** and **SYS** modules, defining python functions, calling a function, function arguments, Lambda and map function, Importing python module, **Useful Python Packages** – Beautiful Soup, NumPy, iPython, tkinter, **Classes and OOP** - Class definition syntax, objects, class and instance variables, Inheritance and multiple inheritance, Polymorphism, Overloading, Overriding, Data Hiding.

Unit-5:
Regular Expressions - re module, Searching a string (match and search), Finding a string (findall), Break string into substrings (split), Replace part of a string (sub), **Examples of Regex** - Return the first word of a given string, Extract all the words of a given string, Extract domain name from given e-mail id's, Extract date from given string, Return all the words of a string that starts with vowel, Split a string with multiple delimiters, Retrieve some information from HTML or XML file.

Unit-6:
File Handling - Reading keyboard input, opening and closing file, Read, Write and Append mode, Create and Read a text file, Looping over a file object, Writing on a file, with statements, splitting lines in a text file, Renaming and Deleting files, **Exception Handling** - Exceptions, Why use exceptions, Raising an exception, try and except, try, except and else clause; try and finally

Text and Reference Books:

1. Python Programming for the Absolute Beginner By Laila M. Dawson
2. Learn Python the Hard Way By Zed A.Shaw
3. Learning Python By Mark Putz Python Documentation (https://docs.python.org)

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the syntax, semantics, and basic constructs of Python programming, including variables, data types, and operators.
CO2: Apply control structures such as decision-making and loops to develop logic-based Python programs.
CO3: Develop modular programs using functions, built-in libraries, and user-defined modules.
CO4: Implement programs using data structures such as strings, lists, tuples, sets, and dictionaries.
CO5: Create file handling programs and apply object-oriented programming concepts such as classes, objects, inheritance, and polymorphism in Python.

BSCS403: Cryptography and Data Security

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	Examination Scheme:
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite:

1. Computer Networking
2. Fundamentals of Operating Systems and Data Communication

Course Objectives:

1. To define cryptography, its use, areas where cryptography is needed.
2. To understand security concepts, Ethics in Network Security, security threats, and the security services.
3. To develop code to implement a cryptographic algorithm using any programming language.
4. To analyze all key less and keyed algorithms to identify their strength and weaknesses and try to solve and remove the limitations or optimize the complexity of algorithm(s).
5. To test different available algorithms in terms of complexity, response time, key size, data size, security assurance, etc.

Detailed Syllabus:

Unit-1: **Introduction to Cryptography:** Introduction To Security Attacks, Services & Mechanisms, And Conventional Encryption: Classical Techniques, cryptanalytic attacks.
Unit-2: **Private Key Encryption:** Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, Double DES, Triples DES.
Unit-3: **Public Key Encryption:** Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm, public key distribution, symmetric key distribution using asymmetric cryptosystem.
Unit-4: **Hash Functions:** Message Authentication & Hash Functions, Authentication Functions, Message Authentication Codes (MAC), Secure Hash Algorithm (SHA), Digital Signatures.
Unit-5: **Application Layer Security:** Electronic Mail Security, Pretty Good Privacy (PGP). **Transport Layer Security:** Secure Socket Layer & Transport Layer Security. **Network Layer Security:** Authentication Header, Encapsulating Security Payloads.

Unit – 6:

Network and System Security: Authentication Applications-Kerberos X.509, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles.

Text and Reference Books:

1. Cryptography and Network Security: Principles and Practice, William Stallings, Prentice Hall, New Jersey, 4th Edition.
2. Introduction to cryptography, Johannes A. Buchmann, Springer, Verlag, 2001.
3. Cryptography and Network Security, Atul Kahate, TMH, 2nd Edition.
4. Cryptography, Forouzan, TMH, 2007.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamentals of data security, network security, and cryptographic techniques.
CO2: Identify common security threats, vulnerabilities, and attacks on data and networks.
CO3: Apply symmetric and asymmetric encryption algorithms for securing data communication.
CO4: Analyze various network security protocols such as SSL, TLS, IPsec, and firewalls.
CO5: Design basic security solutions using authentication methods, intrusion detection systems, and access control mechanisms.

BSCS404: Data Communication and Computer Networks

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	Examination Scheme:
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite:

1. Familiarity with the fundamentals of Digital Electronics.
2. A network simulation method.

Course Objectives:

1. Learn how computer network hardware and software operate.
2. Investigate the fundamental issues driving network design.
3. Learn about dominant network technologies.

Detailed Syllabus:

Unit-1: **Data Communications:** Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies –Protocols and Standards – ISO / OSI model, Example Networks such as ATM, Frame Relay, ISDN Physical layer: Transmission modes, Multiplexing, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.
Unit-2: **Physical Layer:** Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Introduction to Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching methods, integrated services digital networks
Unit-3: **Medium Access sub layer:** Channel Allocations, LAN protocols -ALOHA protocols, Collision free Protocols-Token Passing, IEEE standards, Ethernet and Token Ring. Data Link Layer: Framing, Error detection and correction codes: checksum, CRC, hamming code, Sliding Window Protocols: Stop & Wait ARQ, Go-back-N ARQ, Selective repeat ARQ
Unit-4: **Network Layer:** Point-to Point networks, Routing algorithms, Congestion control algorithms, Internetworking Devices, IP protocol, IP addresses: IPv4 classful and classless addressing, Introduction to IPv6
Unit-5: **Transport Layer:** Connection management: Three-way Handshaking. Introduction of User Datagram Protocol (UDP), Basics of Transmission Control Protocol. (TCP).

Unit-6:
Application Layer: File Transfer Protocol, Domain Name System, Electronic mail, Intro of Client server model, Hyper Text Transfer Protocol, WWW, Example Networks - Internet and Public Networks

Text and Reference Books:

1. 1. Database System Concepts, Henry Korth , A. Silberschatz, 5th Edition, 2005.
2. An Introduction to Database System, Bipin Desai, Galgotia Publications, 1991.
3. SQL, PL/SQL the Programming Language of Oracle, Ivan Bayross, BPB Publications, 4th Edition.
4. Schaum's Outline of "Fundamental of Relational Databases", Ramon A. Mata, Pauline K. Cushman, McGraw Hill, December, 2006.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic concepts of data communication, network models, and transmission media used in modern communication systems.
CO2: Explain the functions and protocols of different layers in the OSI and TCP/IP network models.
CO3: Analyze error detection and correction techniques, as well as flow and congestion control mechanisms in reliable data transfer.
CO4: Evaluate different switching techniques, IP addressing schemes, and routing algorithms used in network communication.
CO5: Demonstrate knowledge of various network topologies, protocols, and security measures used in wired and wireless networks.

BSCS501: Internet Technologies

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	Examination Scheme:
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: HTML and CSS.

Course Objectives:

1. Understand and Apply the Fundamental Concepts of HTML, CSS, and JavaScript to Build Structured, Responsive, and Interactive Web Pages
2. Evaluate understanding of responsive design principles, advanced CSS techniques, and the use of preprocessors.
3. Design and Implement Responsive Web Interfaces Using Advanced CSS Techniques and Preprocessors to Enhance User Experience Across Devices
4. Write simple JavaScript code to manipulate the DOM and respond to user interactions.
5. Analyze and Implement Advanced JavaScript Techniques to Develop Modular, Efficient, and Maintainable Web Applications.

Detailed Syllabus:

UNIT I (10 Hours):

The Internet and WWW: Evolution of the Internet, Intranet, Extranet, Application areas: E-commerce, Education, Entertainment, ISPs, Growth of the World Wide Web, protocols governing the web, Internet accessing tools, Access methods: dialup, ISDN, ADSL/2+, cable, LAN, WIFI, Mobile & Satellite, Proxy servers. Mechanism of accessing internet on different devices, Search engines and their Searching techniques, Article on searching techniques used by various search engines: GOOGLE, YAHOO, BING.

UNIT II (10 Hours):

Process, Standards and Protocols: TCP/IP model, TCP/IP fixed and dynamic IP addressing, IPv4 and IPv6, DNS and URLs. Servers and gateways. Remote login: telnet, HTTP and HTTPS, Internet governing bodies: Role of W3C, ISO.

UNIT III (10 Hours):

Security and Performance: Security policies/ Identification/ Authentication /Access control. Threats and attack methods such as Viruses, Spam, “phishing”, Firewalls.

Performance: speed, reliability, downtime, and bandwidth.

Transmission Security: Encryption Techniques, Symmetric Encryption- Keys and Data Encryption Standards, triple encryption, Asymmetric encryption- Secret key encryption, public and private pair key encryption, Virtual Private Network.

UNIT IV (10 Hours) :

Website Development: Web development strategies, Web applications. Client-Server model, applications running over the internet and their types, HTML Formatting Tags, Images, Links, Lists, Tables, Frames, Forms, Comments in HTML, DIV and SPAN, CSS. Introduction to web development IDE: Dreamweaver -it's working.

UNIT V (6 Hours) :

Client-side scripting: DHTML, Java-Script Introduction, Statements, Loops, Arrays, Functions, Objects in JavaScript, Events and Event Handling, Validation, DOM model, Introduction to AJAX.

Server-Side Programming: Introduction to server-side scripting, Introduction to Active Server Pages (ASP) and Java Server Pages (JSP)

UNIT VI (10 Hours):

PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, GET and POST Methods, Cookies, Sessions**.**

Database action: Connectivity using Register, Signup, Login facilities.

Text and Reference Books:

1. Pankaj Sharma, Introduction to Web Technology's. Kataria and Sons,3rd Edition
2. Web Technology and Design, Xavier, C, New Age International, 1st Edition 2010
3. HTML, DHTML, Java Script, Perl & CGI, Ivan Bayross, BPB Publication, 2008
4. Internet and Web Design, Ramesh Bangia, New Age International, 2nd Edition, 2007
5. Data Communication and Networking, Behrouz A Frouzan, TMH, 4th Edition 2004.
6. Ullman, "PHP for the Web: Visual QuickStart Guide", Pearson Education

Course Outcomes:

After completing the course, students will be able to:

1. Students will be able to identify the different computational problems and their associated complexity.
2. Students will be able to differentiate and give examples for the different
3. types of automata like finite automata, push down automata, linear bounded automata and Turing machine.
4. To apply the techniques of designing grammars and recognizers for several programming languages.
5. Students will be able to correlate the different types of automata to real world applications.

BSCS502: GUI using .NET Framework

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	Examination Scheme:
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite:

1. OOPs Concepts.
2. GUI Interfaces, HTML and CSS.

Course Objectives:

1. To introduce the fundamentals of the .NET framework and its architecture for developing GUI-based applications.
2. To enable students to design and implement graphical user interfaces (GUIs) using Windows Forms and relevant .NET controls.
3. To provide knowledge of event-driven programming and how user interactions are handled in a .NET environment.
4. To develop practical skills in building, debugging, and deploying GUI-based desktop applications.

Detailed Syllabus:

Unit-1: **The .Net framework:** Introduction of .Net, The Origin of .Net Technology (OLE technologies, COM technologies, .NET technologies), The architecture of .Net Framework, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.
Unit-2: **Introduction of Programming Language C#:** Introduction of C#, Characteristics of C#, Differences between C# and C++, Differences between C# and JAVA, C# program introduction: The Main method specification, Namespace, Variables: Declaring implicit and explicit variables, Data-types, Boxing and Un-boxing.
Unit-3: **Controlling program execution:** IF statements, CASE (switch) statements, Operators, Looping, Storing multiple values with arrays. Inheritance, Method Overloading and method overriding, Polymorphism, Operator Overloading, Abstract Class, Inner Class, Interface, Delegates, Partial Classes, Errors and its types, Exception Handling.
Unit-4: **GUI –Controls and Their Event Handling:** Text Box, Rich Text Box, Masked Text-box, Label, Link Label, Radio Button, Check Box, List Box, Combo Box, Checked List Box. Date Time Picker Control, Calendar Control, Tool Tip, Shock Web Flash Object. **Navigation Control and Its Event Handling:** Context Menu Strip, Tool Strip, Status Strip, Tool Strip Container.

Unit-5:

Containers and its Event Handling: Flow Layout Panel, Group Box, Panel, Split Container, Tab Control, Table Layout Panel.

Dialog Boxes and its Event Handling: Message Dialog Boxes, Color Dialog, Folder Browser Dialog, Font Dialog, Open File Dialog, Save File Dialog.

Unit-6:

Data Controls: Data Source, Data Set, and Data Grid View displaying Record in the Grid View Controls. ADO.Net: Connected and Disconnected Architecture, Displaying Record from the Database, Inserting Record into Database, Creating Login using Database, Deleting Record from the Database, Fetching Record from the Database, Update Record in the Database, Creating Setup of .Net Application using Set up Wizard.

Suggested Readings:

1. Beginning Visual C# 2008, John Wiley, Wrox, May 2008.
2. Microsoft .Net for Programmers, Fergal Grimes, SPI, 2002.
3. Programming with C#, E. Balagurusamy, TMH, 1st Edition.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the architecture and components of the .NET Framework for developing GUI-based applications.

CO2: Design and implement user-friendly graphical interfaces using Windows Forms and standard .NET controls.

CO3: Apply event-driven programming techniques to handle user interactions and system events effectively.

CO4: Develop desktop applications using C# or VB.NET with features such as menus, dialogs, and data input validation.

CO5: Debug, test, and deploy GUI applications while ensuring usability, responsiveness, and maintainability.

BSCS503: Data Mining

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
1	1	0	35	15	0	50

Teaching Scheme:	Examination Scheme:
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite:

1. Basic Knowledge of Database Management Systems (DBMS)
2. Fundamentals of Programming and Data Structures.

Course Objectives:

1. To introduce the concepts and architecture of data warehousing
2. To enable students to understand the principles and techniques of data mining
3. To develop the ability to apply data mining algorithms
4. To provide insight into the practical applications of data warehousing and mining

Detailed Syllabus:

UNIT 1- Data Mining:
Definition, Data Mining as the Evolution of Information Technology, Knowledge Discovery Process (KDP), Classification of Mining systems, Techniques involved.
Data Preprocessing:
Needs, Pre-processing data, Data Cleaning, Data integration and transformation, data reduction, discretization, Concept of hierarchy generation.

UNIT 2:
Definition, Differences between Operational Database Systems and Data Warehouses, OLTP vs. OLAP, 3 Tier Architecture of Data Warehouse, Concept of ETL.
Data Cube- A Multidimensional Data Model, Stars, Snowflakes, and Fact Constellations: Schemas for Multidimensional Data Models, OLAP operation

UNIT 3- Data Warehouse:
Introduction to Association Rule and Association Rule Mining, Classification: Decision Tree Induction, K-nearest neighbor, Clustering: Cluster Analysis.

Text and Reference Books:

1. Data Mining -Concepts and Techniques, Han, Kamber, Harcourt India, 2006.
2. Data Mining Introductory and advanced topics, Margaret H Dunham, Pearson, 2002.
3. Data Mining Techniques, Arjun K. Pujari, University Press, 2001.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the architecture and components of data warehousing systems.
CO2: Apply data preprocessing and transformation techniques to prepare data for mining.
CO3: Implement data mining algorithms for classification, clustering, and association rule mining.
CO4: Analyze large datasets to discover hidden patterns and support decision-making.
CO5: Evaluate the performance and accuracy of data mining models and techniques.

BSCS514 (DSE): Artificial Intelligence

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	Examination Scheme:
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite: - Should have knowledge about advanced mathematics

Course Objectives:

1. The main objective of AI to build intelligent machine which can perform and act like humans.
2. The main objective of this course is to understand how these algorithms works and how to analyze the data to make a proper decision.
3. As we know AI is in used in all fields like healthcare industry, mobile world, Retail,
4. Fraud detection etc. so demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.
5. To initiate the concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems in different fields.
6. To evaluate the different stages of development of the AI field from human like behavior to Intelligent Agents.

Detailed Syllabus:

Unit-1: **Introduction:** Overview of Artificial Intelligence- Problems of AI, AI and related fields. **Problem Solving:** Problems, Problem Space & Search: Defining the Problem as State Space Search, Production System, Problem Characteristics, issues in the design of Search Programs.
Unit-2: **Search Techniques:** Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Comparing Uniform Search Strategies, Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search.
Unit-3: **Knowledge representation:** Knowledge Representation Issues, Representation and Mapping, Approaches to Knowledge Representation, Issues in Knowledge Representation, Knowledge manipulation, Knowledge acquisition.
Unit-4: **Using Predicate Logic:** Representing Simple Fact in Logic, Representing Instant & ISA Relationship, Computable Functions & Predicates, Resolution, natural deduction. **Representing Knowledge Using Rules:** Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward Reasoning, Matching, Control Knowledge.
Unit-5: **Natural Language Processing:** Introduction, Syntactic Processing, Semantic Analysis, Discourse & Pragmatic Processing.

Unit-6: **Expert System:** Rule based system architecture, Non production system architecture, knowledge organization and validation, Existing Systems (DENDRAL, MYCIN).
Text and Reference Books: 1. "Artificial Intelligence", Ritch & Knight, TMH, 2006. 2. "Introduction to Artificial Intelligence & Expert Systems", Patterson, PHI, 2007. 3. "Artificial Intelligence: A Modern Approach", Russell, S., Norvig, P, Pearson Education, 2006. 4**.** "Introduction to A.I.", Charnick, Addision Wesley, 1999.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts, history, and applications of Artificial Intelligence.
CO2: Apply search algorithms and problem-solving strategies in AI environments.
CO3: Implement knowledge representation techniques such as semantic networks, frames, and logic-based models.
CO4: Analyze and apply basic machine learning algorithms for classification and prediction.
CO5: Demonstrate the ability to design intelligent agents and solve real-world problems using AI techniques.

BSCS515 (DSE): Artificial Neural Networks

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	Examination Scheme:
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite: - Machine Learning

Course Objectives:

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. Introduce students to artificial neural networks and fuzzy theory from an engineering perspective.
3. To give design methodologies for artificial neural networks.
4. To provide knowledge for network tunning and overfitting avoidance.
5. To offer neural network implementations.
6. To demonstrate neural network applications on real-world tasks.

Detailed Syllabus:

Unit-1: **Fundamental of Neural Networks:** Introduction, Model of Artificial Neuron, Architectures, Learning Methods, Taxonomy of NN Systems, Single Layer NN System, Applications.
Unit-2: **Multilayer NN System and Backpropagation Networks:** Background, Backpropagation Learning, Backpropagation Algorithm, Learning in Multilayer NN Systems. Applications of Backpropagation Algorithm.
Unit-3: **Associative Memory:** Introduction, Auto-associative Memory, Bi-directional Hetro-associative memory. Applications of Associative Memory.
Unit-4: **Self-Organizing Maps (SOMs):** Introduction to supervised and unsupervised learning. Competitive Learning, SOMs and their working principles, applications.
Unit-5: **Adaptive Resonance Theory:** Stability-Plasticity Dilemma, ART Networks, Iterative Clustering, Unsupervised Learning, ART Networks and their working principles, applications.
Unit-6: **Introduction to Soft Computing:** Basics of Soft Computing, Components of Soft Computing. Introduction to Fuzzy Logic, Genetic Algorithms.

Text and Reference Books:

1. Neural Networks, Fuzzy Logic and Genetics Algorithms- Synthesis and Applications by
2. Rajasekaran and G.A. Vijaylakshmi Pai, Prentice Hall.
3. Neural Networks: A Comprehensive Foundation by Simon S. Hakin, Prentice Hall.
4. Fundamental of Neural networks: Architecture, Algorithms and Applications by Laurene V. Fausett, Prentice Hall.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic structure, functioning, and learning processes of artificial neural networks.
CO2: Apply various activation functions and learning algorithms used in neural network models.
CO3: Design and implement single-layer and multi-layer neural networks for pattern recognition and classification tasks.
CO4: Analyze and evaluate the performance of neural networks using training and testing datasets.
CO5: Explore advanced neural architectures such as convolutional and recurrent neural networks for solving real-world problems.

BSCS516 (DSE): Theory of Computations						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	**Examination Scheme:**
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite: Basic Knowledge of Discrete Mathematics, Fundamentals of Programming and Algorithms

Course Objectives:

1. To introduce the fundamental concepts of formal languages, grammars, and automata that form the theoretical foundation of computer science.
2. To develop the ability to design and analyze finite automata, pushdown automata, and Turing machines for solving computational problems.
3. To provide an understanding of the classification of languages and computational models in terms of their expressive power and limitations.
4. To enable students to explore decidability, reducibility, and the concept of computational complexity for determining problem solvability.

Detailed Syllabus:

UNIT I : **Introduction:** Basic Concepts: Formal proofs, Additional form of Proofs, Inductive proof, Sets, Relation, Kleen Closures, Graphs, Trees, Symbol, Alphabets, strings and languages, automata and grammar, Applications of automata theory.
UNIT II : **Finite Automata:** Basic Machine and Finite State Machine. Finite Automata: Definition and Types of Automata- DFA, NFA, Construction of DFA and NFA, NFA with epsilon-Moves, Minimization Of FA, Equivalence of NFA and DFA, Conversion of NFA with epsilon moves to NFA, Conversion of NFA with epsilon moves to DFA, Moore and Mealy Machines, Inter-conversion between Moore and Mealy Machines.
UNIT III : **Regular Expressions, Regular Grammar and Languages:** Definition and Identities of Regular Expressions, regular and non-regular language, operations on RE and their precedence, Algebraic laws for RE, Regular Expression and Finite Automata, Conversion from RE to FA and DFA to RE, Arden's theorem, Pumping Lemma for RL.
UNIT IV : **Context Free Grammar and Languages:** Definition and Construction of CFG, Definition and Generation of CFL from CFG, Derivation, derivation trees, Ambiguous Grammar and Removal of Ambiguity. Simplification of CFGs. Normal Forms of Grammar: CNF and GNF.

UNIT V: **Pushdown Automata:** Definition of push down automata, The language of PDA, Definition and Construction of DPDA and NPDA. Equivalence of PDAs and CFGs, Closure Properties Of CFLs.
UNIT VI: **Turing Machines:** Definition and Construction of Turing Machines. Languages of TM. Types of TM. Comparison And Applications of DFA, PDA and TM.

Text and Reference Books:

1. John C. martin, "Introduction to Language and Theory of Computation", TMH, Third Edition.

2. Michel Sipser "Introduction to Theory of Computation" Thomson Course Technology, Second Edition .

3. Kavi Mahesh, "Theory of Computation" Wiley-India.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand and describe the foundational concepts of formal languages, grammars, and automata theory.
CO2: Design and analyze deterministic and non-deterministic finite automata for recognizing regular languages.
CO3: Construct context-free grammars and pushdown automata to represent context-free languages and solve parsing problems.
CO4: Demonstrate the working of Turing machines and analyze their capability to model any computation.

BSCS517 (DSE): Software Testing & Quality Assurance						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	**Examination Scheme:**
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite: - programming languages, software engineering.

Course Objectives:

1. To introduce fundamental concepts, methods, and tools used in software testing, validation, and verification.
2. To develop skills in designing and executing effective test plans, test cases, and test strategies for software systems.
3. To impart knowledge about software quality models, quality standards (such as ISO, CMM), and quality assurance practices.
4. To enable students to analyze software defects, manage test processes, and ensure delivery of reliable and high-quality software products.

Detailed Syllabus:

UNIT I (6 Hours): Software Quality Assurance: Software crisis, Birth of software engineering, Why Software engineering, Criteria for the success of a software project, phases in SDLC, Software Quality Assurance, Quality Management Systems.
UNIT II (10 Hours): Software Testing Process: Verification and Validation, Cost of Quality, Why Testing is difficult, Levels of testing-Unit Testing, Module Testing, Integration and System Testing, Acceptance Testing, Testing Approaches: Top-down versus Bottom-up, Functional versus Structural testing, Mutation testing, Regression Testing, Types of Testing, Manual Testing and its Limitations.
UNIT III (10 Hours): Software Testing Tools: Need for Automated Testing Tools, Taxonomy of testing tools, Functional/Regression Testing Tools, Performance Testing tools, Testing Management Tools, Source Code Testing Tools, how to select a Testing Tool?
UNIT IV (12 Hours): WinRunner: Overview, testing an application using WinRunner, TestScript Language (TSL), GUI MAP file, Synchronization of Test cases, Data driven testing, Checking GUI objects.

UNIT V (12 Hours) : SQA Robot: overview, testing an application, Synchronization of Test procedures, creating checkpoints.TestDirector: overview, testing management process, managing the testing process using TestDirector.
UNIT VI (6 Hours): Source Code Testing Utilities in Unix and Linux Environnement : GNU tools, Timings of programs, Profiler, Code optimization, Productivity tools, Portability Testing Tool, Configuration Management Tools, Coding Guidelines and Standards.

Text and Reference Books :

1. "Effective Software Testing", Elfriede Dustin, Pearson Education, IV edition.
2. "Software Testing Concepts and Tools", N. R. Pusuluri, Dreamtech press, 2008.
3. "Automated Software Testing", Jeff Rashka, John Paul and E. Dustin, Pearson
4. Education, 2008.
5. "Effective Methods For Software Testing", W. E. Perry, Wiley-India, III edition.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand and explain the principles, methodologies, and techniques used in software testing and quality assurance.
CO2: Design and develop effective test plans, test cases, and test strategies for functional and non-functional testing.
CO3: Apply various testing techniques such as white-box, black-box, unit, integration, system, and regression testing.
CO4: Analyze software quality standards, metrics, and models (e.g., ISO, CMM, Six Sigma) to assess software process maturity.
CO5: Utilize automated testing tools and quality assurance frameworks to enhance software reliability and maintainability.

BSCS601: PHP						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	**Examination Scheme:**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Course Objectives:

1. To give knowledge about server site programming.
2. To introduce latest web development language.
3. To give knowledge about MySQL database management.
4. To explore the skills of programming in the file of online web project.

Course Objectives:

1. To introduce the fundamentals of server-side scripting using PHP for dynamic web development.
2. To enable students to handle form data, manage sessions, and interact with databases using PHP and MySQL.
3. To develop problem-solving skills through the creation of interactive and data-driven web applications.
4. To familiarize students with file handling, error handling, and security practices in PHP programming.

Detailed Syllabus:

Unit-1: Introduction to PHP: - Evaluation of Php, Basic Syntax, defining variable and constant, Php Data type, Operator and Expression, Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.
Unit-2: Function: - What is a function, define a function, Call by value and Call by reference, Recursive function, PHP GET and POST, Built-in Functions, User-Defined Functions, Functions with Parameters, Values and arguments in Function.
Unit-3: String and Array: -String - Creating and accessing String, Searching & Replacing String, Formatting String, String Related Library function, Array- Anatomy of an Array, creating index based and Associative array, accessing array Element, Looping with Index based array, looping with associative array using each () and foreach (), Some useful Library function

Unit-4: Introduction to OOPS- Introduction, Objects, declaring a class, the new keyword and constructor, Destructor, Access method and properties using $this variable, Public, private, protected properties and methods, Static properties and method, Class constant, Inheritance & code reusability, Polymorphism, Parent: & self: keyword, Instance of operator, Abstract method and class, Interface, Final
Unit-5: Exception Handling, file and Directories: -Understanding Exception and error, Try, catch, throw, Global Exception Handler, Defining Custom Exceptions, understanding file& directory, Opening and closing a file, Coping, renaming and deleting a file, working with directories.
Unit-6: Database Connectivity with MySQL:-Introduction to RDBMS, Connection with MySql Database, Performing basic database operation (DML) (Insert, Delete, Update, Select), Executing query, Framework.

Text and Reference Books:

1. Lynn Beighley & Michael Morrison- Head First Php& MySQL.
2. Robin Nixon: Learning Php, MySQL, Java script and CSS: A step-by-step guide to creating dynamic websites.
3. Luke Welling & Laura Thompson: PHP & MYSQL web development

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic syntax, variables, data types, and control structures of PHP.
CO2: Create dynamic web pages using PHP with HTML forms and user input handling.
CO3: Implement session management and cookie handling for stateful web applications.
CO4: Connect PHP applications with MySQL databases to perform CRUD operations.
CO5: Develop secure and efficient web applications with file handling, error handling, and form validation in PHP.

BSCS602: Multimedia and Animations						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme:	**Examination Scheme:**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite:

1. Basic Knowledge of Computer Fundamentals
2. Familiarity with Graphics and Image Editing Software

Course Objectives:

1. To introduce the fundamental concepts of multimedia and its components such as text, image, audio, video, and animation.
2. To provide knowledge of multimedia hardware and software tools used in content development.
3. To develop skills for designing and integrating multimedia elements for various applications.
4. To familiarize students with multimedia standards, file formats, and compression techniques.

Detailed Syllabus:

Unit-1: **Introduction to Multimedia:** Definition of Multimedia, CD-ROMs and Multimedia applications. Multimedia Requirements-Hardware, Software, Creativity and organization, Multimedia skills and training.
Unit-2: **Multimedia Hardware:** Hardware requirement for multimedia, Macintosh verses PC. The Macintosh platform, PC platform, Connections, Memory and storage devices, input devices, output hardware, Communication devices.
Unit-3: **Multimedia Software:** Basic tools, painting and drawing tools, OCR software, Sound editing programs, Animation devices and digital movies and other accessories, linking multimedia objects, office suites, word processor
Unit-4: **Multimedia Tools:** Spreadsheets presentation tools, Types of authoring tools card and page-based, Icon based and time-based authoring tools, Object oriented tools.

Unit-5: **Production Tips:** Image-creation, making still images, images colors, Image, File format, image editing.
Unit-6: **Multimedia Project :** stages of project - Multimedia skills - design concept - authoring - planning and costing –Multimedia Team. **Multimedia-looking towards Future:** Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing

Text and Reference Book:

1. Multimedia Making It Work, Tay Vaughan, TMH, 5th Edition.
2. Multimedia Power Tools, Peter Jerram, M. Gosney, Random House Electronics Publishing, 2nd Edition

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the core concepts and components of multimedia, including text, audio, video, images, and animation.
CO2: Identify and use appropriate multimedia hardware and software tools for content development.
CO3: Apply multimedia design principles to create interactive and visually engaging applications.
CO4: Analyze various multimedia file formats, standards, and compression techniques.
CO5: Develop simple multimedia projects demonstrating integration of different media elements.

BSCS603: Digital Marketing

L	T	P	Theory	Internal	Total Marks
Hours					
1	1	0	35	15	50

Teaching Scheme:	Examination Scheme:
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite: Knowledge of Social Media Platforms.

Course Objectives:

1. To understand the importance of Digital Marketing.
2. To study various types of Digital Marketing.
3. To know the significance of Digital and Internet Marketing.
4. To understand the recent trends in digital advertising and SEO.
5. To create a campaign on any social media platform.

Detailed Syllabus:

Unit-1 :

Introduction to Digital Marketing: Evolution of Digital Marketing from traditional to modern era, Role of Internet; Current trends, Info-graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment; Digital marketing strategy; P.O.E.M. framework, Digital marketing plan, Digital marketing models.

Internet Marketing and Digital Marketing Mix: Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix

Unit-2:

Social Media Marketing: Role of Influencer Marketing, Tools & Plan–Introduction to social media platforms, penetration characteristics; Building a successful social media marketing strategy. Facebook Marketing, LinkedIn Marketing, Twitter Marketing, Instagram Marketing:

Mobile Marketing: Mobile Advertising, Forms of Mobile Marketing, Features,

Unit-3:

Introduction to SEO and SEM: Trends in Digital Advertising– - Introduction and need for SEO, how to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics, Introduction to SEM.

Web Analytics: Google Analytics & Google Ad Words; data collection for web analytics. Online Reputation Management.

Suggested Readings:

1.Seema Gupta, Digital Marketing, Mc-Graw Hill, 1st Edition - 2017
2. Ian Dodson, The Art of Digital Marketing, Wiley Latest Edition
3.Puneet Singh Bhatia, Fundamentals of Digital Marketing, Pearson 1st Edition – 2017
4.Vandana Ahuja, Digital Marketing, Oxford University Press Latest Edition
5. Philip Kotler Marketing 4.0: – Moving from Traditional to Digital Wiley 2017

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the core concepts and components of digital marketing, including SEO, SEM, content marketing, and social media marketing.
CO2: Analyze consumer behavior and digital trends to design effective online marketing strategies.
CO3: Use digital tools and platforms such as Google Ads, Google Analytics, and social media channels for campaign execution.
CO4: Evaluate the performance of digital marketing campaigns using key metrics and reporting techniques.
CO5: Apply ethical, legal, and best practice standards in developing and managing digital marketing content and strategies.

BSCS614 (DSE): Numerical Algorithms and Operation Research						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	**Examination Scheme:**
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite: Basic Knowledge of Mathematics and Linear Algebra, Fundamentals of Programming and Algorithms

Course Objectives:

1. To introduce the fundamental concepts of numerical methods for solving mathematical problems such as linear equations, interpolation, differentiation, and integration.
2. To develop the ability to design, implement, and analyze numerical algorithms for accurate and efficient computation.
3. To provide a strong foundation in operations research techniques such as linear programming, transportation problems, and network models for effective decision-making.
4. To enable students to apply numerical and optimization techniques in real-world scenarios using computational tools and software.

Detailed Syllabus:

Unit-1: **Computer Arithmetic:** Floating point representation of numbers, arithmetic operations with normalization, consequences of normalized floating-point representation of numbers, Errors innumbers.
Unit-2: **Finding the roots of an equation:** Iterative method: Introduction, Beginning an iterative method, Bisection method, Newton Raphson method, Regula Falsi method. Comparison of Iterative methods, Order of Convergence of Newton Raphson Method and Secant Method.
Unit-3: **Ordinary differential equations:** Euler‟s method, Taylor series method, Range Kutta II and IV order methods. **Numerical Integration:** Simpson‟s 1/3 and 3/8 rule, Trapezoidal rule.
Unit-4: **Solving simultaneous linear equations:** Introduction, Gauss Elimination method, pivoting, ill conditioned equations, Gauss Jordon method, and Gauss-Seidel iterative method. Comparison of direct and iterative methods..

Unit-5:

Some important definitions – Solutions to LPP, Feasible Solution, Basic Solutions, Basic Feasible Solution, Optimum Basic Feasible Solution, Unbounded Solution. Assumptions in LPP, Limitations of LPP, Applications of LPP and advantages of LPP

Standard Linear Programming – Formulation of a Linear Programming Solving L.P.P. by Graphical Method Problem and Simplex Method.

Unit-6:

Transportation Problems – Method of finding initial basic feasible solution to Transportation Problem- North West Corner, Least Cost Method and Vogel‟s Method. Method of finding initial basic feasible solution to Assignment Problem using Hungarian Method.

Reference Books:

1. Computer Oriented Numerical Methods by Rajaraman. V.
2. "Operation Research", by S.D.Sharma Kedarnath Ramnath Publishers 16th edition 2010
3. Numerical Methods by S.S. Sastry.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand and explain various numerical methods for solving algebraic, transcendental, and differential equations.
CO2: Apply interpolation, numerical differentiation, and integration techniques to solve real-world engineering and scientific problems.
CO3: Design and implement efficient numerical algorithms using programming languages or software tools.
CO4: Formulate and solve linear programming problems and optimization models using appropriate OR techniques.
CO5: Analyze and evaluate the outcomes of numerical and operational research methods for informed decision-making in practical applications.

BSCS615 (DSE): E-Business

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	Examination Scheme:
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite: - Basic Knowledge of Internet and Web Technologies, Fundamentals of Business and Commerce

Course Objectives:

1. To introduce the fundamental concepts, models, and technologies involved in conducting business over the internet.
2. To provide an understanding of various e-business models, strategies, and their application in different business domains.
3. To familiarize students with the infrastructure, legal frameworks, payment systems, and security issues associated with e-business.
4. To enable learners to analyze the impact of e-business on global markets, customer relationships, and business operations.

Detailed Syllabus:

Unit-1:
Introduction to Electronic Commerce: Definition, e-commerce v/s traditional commerce, , E-Com vs. E-Business ,Framework of E-Commerce: The Information Superhighway, Multimedia Content and Network Publishing, Messaging and Information Distribution, Services Infrastructure. E-Commerce Models.

Unit-2:
Securing Business on Network: Web Security issues related to e-business, e-commerce threats: Communication channel ,Secrecy threats, Web server threats, Security by Digital Signatures.

Unit-3:
E-Payment Methods : Elements involved in Electronic Payment Systems, Brick and Mortar: Payment Authorization and Settlement, Smart Cards and its types, Credit Cards, Security Issues in Electronic Payment Systems.

Unit-4:
Different e-Transactions: EDI- Definitions, EDI-Layered Architecture, Advantages & Limitations of EDI, Firewalls: Packet Filtering, Application Level Firewalls, Transaction Security: Active and Passive attacks, Fabrication, Interruption , Interception,Modification.

Unit-5: **WAP and WWW :**WAP technology and its benefits, WAP Protocol Suit: WDP,WTP,WSP,WTLS, Comparison between WWW and Wireless Application Protocol, WWW based security schemes.
Unit-6: **Mobile Commerce and Security Issues :** Overview, Framework of M-Commerce:, Introduction of Home Banking, Security issues related to Online Banking.

Text and Reference Books:

1. Frontiers of Electronic Commerce- Ravi Kalakota&Whinston, 10th edition, Pearson.
2. Electronic Commerce-Bharat Bhaskar, IInd Edition, TMH.
3. E-business- Daniel Amor, Ist, Pearson
4. Electronic Commerce- Turban & Lee, Ist, Pearson
5. Electronic Commerce- Ravi Kalakota&Whinston, VIIth edition, Pearson.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand and explain the key concepts, models, and frameworks of electronic business and e-commerce.
CO2: Analyze various e-business models and evaluate their effectiveness in different market scenarios.
CO3: Demonstrate knowledge of digital payment systems, e-business infrastructure, and online transaction protocols.
CO4: Identify security, legal, and ethical issues in e-business and propose suitable solutions.
CO5: Apply e-business strategies and tools to real-world business problems and assess their impact on organizational performance.

BSCS616 (DSE): Enterprise Resource Planning						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	**Examination Scheme:**
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Prerequisite: - Basic Knowledge of Project Management Skills

Course Objectives:

1. To introduce the fundamental concepts, components, and evolution of ERP systems in business process integration.
2. To provide an understanding of the key modules of ERP such as finance, human resources, supply chain, and customer relationship management.
3. To enable students to analyze the selection, implementation, and challenges of ERP systems in organizational settings.
4. To develop skills for evaluating the impact of ERP solutions on business performance, competitiveness, and decision-making..

Detailed Syllabus:

Unit-1: **Introduction:** ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, The Evolution of ERP, System Architecture of ERP.
Unit-2: **Overview of an enterprise:** Why ERP is required and how can it help in development and deployment of information system in an enterprise? **Case1**: Manufacturing Industry.
Unit-3: **ERP Functional Modules:** Introduction, Client Server Multi tire Architecture of ERP,Standard Modules, Extended ERP, Integration of ERP with SCM and CRM Applications, Concept of e-ERP, Web Architecture of e-ERP.
Unit-4: **ERP Implementation:** Standard Methodology, as is Study, Requirement Engineering and Business Process Reengineering, Reverse Engineering, Batch data conversion from legacy system, Technology set up and testing, Issues/Risks, Impacts, Solution/ Mitigation. **Case2**: Why does ERP implementation fail in more than 50% cases?

Unit-5: **ERP software (any standard ERP package):** Structure, concepts of Data Acquisition, Data Organization, Data Conversion/Reporting, ERP Basis and Maintenance, Programming Interface. **Core Modules:** Financials, Materials, Manufacturing/Conversions, Sales and Distribution, Human Resources.
Unit-6: **ERP Software Services and Opportunities:** Step by step implementation, Document management Systems, Document Linking, Process change and document change & control, ERP Database, Online services/ Helpdesk, Control and security, Managing Communications and Training for ERP, Employment opportunities.

Text and Reference Books:

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill,2007,1st Edition
2. Rahul V. Altekar "Enterprise wide Resource Planning", Tata McGraw Hill, 2004,1st Edition
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI, 2003, 2nd Edition,
4. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology,2001,1st Edition

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the core concepts, evolution, and strategic importance of ERP systems in modern enterprises.
CO2: Describe the functionality and interconnectivity of various ERP modules such as finance, production, HR, and supply chain.
CO3: Analyze the process of ERP implementation, including planning, selection, customization, and integration challenges.
CO4: Evaluate the organizational impact, benefits, and limitations of ERP systems in real-world business scenarios.
CO5: Apply knowledge of ERP systems to assess business needs and propose effective enterprise solutions using ERP tools.

BSCS617 (DSE): Mobile Computing

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
5	1	0	100	50	0	150

Teaching Scheme:	Examination Scheme:
Credits: 6	Mid Term Exam: 20 Marks
	Teachers Assessment: 10 Marks
	Attendance: 20 Marks
	End Semester Exam: 100 Marks

Pre-requisites: Mobile communication and Computer Network, INTERNET, Router

Course Objectives:

1. To introduce the fundamental concepts of mobile computing, including wireless communication, mobility, and network infrastructure.
2. To provide knowledge of various mobile technologies such as GSM, GPRS, CDMA, 3G/4G/5G, Wi-Fi, and Bluetooth.
3. To develop an understanding of mobile IP, mobile TCP, and protocols that support mobility and seamless communication.
4. To enable students to design and evaluate mobile applications and services considering performance, security, and usability in mobile environments.

Detailed Syllabus:

Unit-1: Introduction to mobile communication and computing, Generations of mobile computing, Issues and Applications of mobile computing, Cellular concept and cellular architecture, Frequency reuse, handoff in mobile computing.
Unit-2: GSM: GSM architecture, HLR, VLR, protocol, Call flow sequence in GSM, Security in GSM.CDMA, IS-95 the North American CDMA, Service aspects, radio aspects.
Unit-3: Wireless LAN, Architecture, IEEE-802.11, Hidden and Exposed Terminal Problems. Bluetooth, Bluetooth Architecture, Mobile IP, Terminologies.
Unit-4: Location Management- Motivation, Network Architecture, Location Management in Cellular Network, Static and Dynamic Location Management, Location Management in Wireless Data Networks.
Unit-5: Data Management- Data Management Issues, Mobile Databases, Impact of Mobile Computing in the Area of Data Management, Data Replication, Asynchronous and Synchronous Replication.

Unit-6:

File System: CODA File System. Adaptive Clustering: Adaptive Clustering for Mobile Wireless Networks, Architecture, Algorithm, Cluster Maintenance.

Text and Reference Books:

1. Ashok K Talukdar: Mobile Computing-Technology, Applications and Service Creation, 1st Edition,TMH Publication, 2006.
2. J Schillar: Mobile Communications, 2nd Edition, Pearson Education, 2009.
3. Vishnu Sharma- Mobile computing , 4th Edition, Pearson Eduction, 2010.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic concepts, architecture, and applications of mobile computing and wireless communication.
CO2: Explain various mobile communication technologies such as GSM, CDMA, GPRS, 3G/4G/5G, and their operational principles.
CO3: Analyze mobility management techniques, including mobile IP and mobile transport layer protocols like Mobile TCP.
CO4: Evaluate wireless network technologies such as Wi-Fi, Bluetooth, and ad hoc networks used in mobile computing environments.
CO5: Design and assess mobile applications and services with consideration for power management, security, and quality of service.