Scheme of Instructions & Syllabi

of

Bachelor of Computer Applications

(2025-28)

[As per CBCS guidelines given by UGC]

Total Credit of the Program

Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**Total**
Credits	24	22	22	22	28	26	**144**

Dr. Akash Sanghi	**Prof. YDS Arya**	**Prof. Manish Gupta**
HOD, Computer Applications	Vice Chancellor	Dean, Computer Applications

Faculty of Computer Applications
INVERTIS UNIVERSITY
Bareilly-243123 U.P.

About the Department of Computer Applications

The Department of Computer Applications was established in the year 1999 with the aim of developing professionals in main stream of Computer Applications. The Department offers Under Graduate, Post Graduate degree courses as well as Ph.D. Research Degree courses through Invertis University at Bareilly [U.P.]. The Department analyses regularly the market trends and new developments in the area, conducts massive brainstorming with leading academia and industry professionals to develop the curriculum.

The Department is committed to provide excellence in teaching. It has a rich knowledge pool of well-trained faculty and modern computer labs enabled to impart all required knowledge. Regular hands-on workshops are conducted to update students with the latest technology.

Many of the alumni are working in top companies including IBM, Microsoft, American Express Bank, Wipro, Infosys, Samsung, Microsoft, CISCO, HCL, Jindal and more in India as well as abroad, apart from few also being entrepreneurs and some other, in academics with prestigious institutions.

About the Bachelor of Computer Application (BCA) Program

Bachelor of Computer Applications (BCA) is three years Undergraduate Programme. The curriculum of BCA is designed to meet the growing demand of qualified professionals in the field of ICT. It comprises of the core subjects like DBMS, Networking, Data Structures and core programming languages like C, Python, .NET and Java etc. Students also get exposure to advanced topics like Cryptography and Network Security, Cloud Computing etc. Elective papers help students to have an exposure in Artificial Intelligence, Unix and Shell Programming, Mobile Computing, Artificial Neural Network and Information Technology Trends related subjects.

Bachelor of Computer Applications (BCA)	
Level	Undergraduate Regular
Duration	3 years (6 semesters)
Eligibility Criteria	10+2 from recognized Board

Program Objectives:

1. To empower students with basic skills of various technologies.
2. To develop the ability to identify, analyze, formulate and develop Computer Applications.
3. To enable the students to select modern computing tools and techniques and use them with practical expertise.
4. To prepare the students for facing challenging roles in the IT industry, Computer Applications, Web and Mobile development, Data Analysis, Information Security etc.

Career Path after Completing the Programme:

- Software Developer
- Programmer
- Systems Analyst
- Data Analysts
- Computer Support Engineer
- Database Administrator
- Systems Administrator
- Web Designer & Developer
- Network Administrator

Instructions:

1. For passing any Theory subject examination minimum 40% marks must be separately scored in Theory Paper and Internal Evaluation for that subject.
2. For passing any Practical subject examination minimum 40% marks must be separately scored in its practical Evaluation for that subject.

Outcome Based Learning: Course Outcomes (COs) & Program Outcomes (POs):

In accordance with the lightest teaching paradigms, this BCA program has been designed on the basis of outcome-based learning. At the end of the BCA program, all the students are expected to fulfill the following Programme Outcomes.

Program Outcomes (POs)		
PO1	**Domain 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, 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	**Professionals 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 and commit to professional ethics and responsibilities 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 Entrepreneurship**	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.
PO12	**Life-long learning**	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

At the end of the three-year BCA programme the students will be able to:

1. Understand, analyze and develop computer programs in the areas related to algorithm, web design and networking for efficient design of computer-based system.
2. Work in the IT sector as system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.
3. Apply standard software engineering practices and strategies in software project development using open-source programming environment to deliver a quality of product for business success.

Program Specific Outcomes:

1. Equip themselves to potentially rich & employable field of computer applications.
2. Pursue higher studies in the area of Computer Science/Applications.
3. Take up self-employment in Indian & global software market.
4. Meet the requirements of the Industrial standards.

STUDY AND EVALUATION SCHEME

Bachelor of Computer Applications

(2025-28)

SEMESTER I, YEAR I

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BCA101	Environment & Ecology	AECC1	2+0+0	15	35	50	2
BCA102	Digital Electronics and Computer Organization	CC1	5+1+0	50	100	150	6
BCA103	Programming in C	CC2	3+1+0	30	70	100	4
BCA104	Introduction to MS-Office 365	CC3	3+1+0	30	70	100	4
BCA105	Information Security Fundamentals	SEC1	3+1+0	30	70	100	4
PRACTICAL / PROJECTS							
BCA153	Programming in C Lab	CC2(P)	0+0+4	15	35	50	2
BCA154	Introduction to MS-Office 365 Lab	CC3(P)	0+0+4	15	35	50	2
TOTAL			**16+4+8**	**185**	**415**	**600**	**24**

Ability-Enhancement Compulsory Course (AECC) 1 LIST			
S.No	**Code**	**AECC LIST**	**Subject Name**
1	BCA101	AECC1	Environment & Ecology

STUDY AND EVALUATION SCHEME

Bachelor of Computer Applications

(2025-28)

SEMESTER II, YEAR I

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BCA201	Operating Systems	CC4	5+1+0	50	100	150	6
BCA202	Python Programming	CC5	3+1+0	30	70	100	4
BCA203	Computer Graphics	CC6	3+1+0	30	70	100	4
BCA204	E-Commerce	SEC2	1+1+0	15	35	50	2
BCA205	Industrial Applications	AECC2	1+1+0	15	35	50	2
PRACTICAL / PROJECTS							
BCA252	Python Programming Lab	CC5(P)	0+0+4	15	35	50	2
BCA253	Computer Graphics Lab	CC6(P)	0+0+4	15	35	50	2
TOTAL			**13+5+8**	**170**	**380**	**550**	**22**

****BCA218: Qualifying Paper only for those students who are from non-mathematics background.***

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BCA*	GE ***(Qualifying)***	GE1	3+1+0	30	70	100	0

Ability-Enhancement Compulsory Course (AECC) 2 LIST			
S.No	**Code**	**AECC LIST**	**Subject Name**
1	BCA205	AECC2	Industrial Applications

***Generic Elective Courses (GE)- 1 List**			
S.No	**Code**	**GE LIST**	**Subject Name**
1	BCA216	GE1	Remedial Mathematics ***(Qualifying)***

STUDY AND EVALUATION SCHEME

Bachelor of Computer Applications

(2025-28)

SEMESTER III, YEAR II

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BCA301	Database Management Systems	CC7	3+1+0	30	70	100	4
BCA302	Data Structures	CC8	3+1+0	30	70	100	4
BCA303	Data Communication and Computer Networks	CC9	5+1+0	50	100	150	6
BCA304	Management Information System	SEC3	1+1+0	15	35	50	2
BCA	GE	GE2	1+1+0	15	35	50	2
PRACTICAL / PROJECTS							
BCA351	Database Management Systems Lab	CC7(P)	0+0+4	15	35	50	2
BCA352	Data Structures Lab	CC8(P)	0+0+4	15	35	50	2
TOTAL			**13+5+8**	**170**	**380**	**550**	**22**

Generic Elective Course (GE) 2 List			
S.No	**Code**	**GE LIST**	**Subject Name**
1	BCA315	GE2	Numerical and Statistical Techniques
2	BCA316	GE2	Engineering Mathematics

STUDY AND EVALUATION SCHEME

Bachelor of Computer Applications

(2025-28)

SEMESTER IV, YEAR II

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BCA401	Software Engineering	CC10	5+1+0	50	100	150	6
BCA402	GUI using .Net Framework	CC11	3+1+0	30	70	100	4
BCA403	Cloud Computing	SEC4	1+1+0	15	35	50	2
BCA404	Responsive Web Design-Front End Development	CC12	3+1+0	30	70	100	4
BCA405	Discrete Structures	AECC3	1+1+0	15	35	50	2
PRACTICAL / PROJECTS							
BCA452	GUI using .Net Framework Lab	CC11(P)	0+0+4	15	35	50	2
BCA454	Responsive Web Design-Front End Development Lab	CC12(P)	0+0+4	15	35	50	2
TOTAL			**13+5+8**	**170**	**380**	**550**	**22**

Ability-Enhancement Compulsory Course (AECC) 3 LIST			
S.No	**Code**	**AECC LIST**	**Subject Name**
1	BCA405	AECC3	Discrete Structures

STUDY AND EVALUATION SCHEME

Bachelor of Computer Applications

(2025-28)

SEMESTER V, YEAR III

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BCA501	Data Warehousing & Data Mining	CC13	5+1+0	50	100	150	6
BCA502	MERN Full Stack Development-Backend	CC14	3+1+0	30	70	100	4
BCA503	Multimedia and its Applications	CC15	3+1+0	30	70	100	4
BCA*	DSE	DSE1	3+1+0	30	70	100	4
BCA**	GE	GE3	1+1+0	15	35	50	2
PRACTICAL / PROJECTS							
BCA552	MERN Full Stack Development-Backend Lab	CC14(P)	0+0+4	15	35	50	2
BCA553	Multimedia and its Applications Lab	CC15 (P)	0+0+4	15	35	50	2
BCA*	DSE Lab	DSE1 (P)	0+0+4	15	35	50	2
BCA559	Summer Internship ***	AECC4	0+0+0	15	35	50	2
TOTAL			**15+5+12**	**215**	**485**	**700**	**28**

* **Discipline Specific Elective (DSE) 1 List**			
S.No	**Code**	**DSE**	**Subject Name**
1	BCA514	DSE1	Artificial Intelligence
2	BCA515	DSE1	UNIX and Shell Scripting
3	BCA516	DSE1	PHP
4	BCA554	DSE1 LAB	Artificial Intelligence Lab
5	BCA555	DSE1 LAB	UNIX and Shell Scripting Lab
6	BCA556	DSE1 LAB	PHP Lab

** **Generic Elective Course (GE) 3 List**			
S.No	**Code**	**GE LIST**	**Subject Name**
1	BCA517	GE3	Graph Theory
2	BCA518	GE3	Digital Marketing

Ability-Enhancement Compulsory Course (AECC) 4 LIST			
S.No	**Code**	**AECC LIST**	**Subject Name**
1	BCA559	AECC4	Summer Internship

********* ***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.***

STUDY AND EVALUATION SCHEME

Bachelor of Computer Applications

(2025-28)

SEMESTER VI, YEAR III

Course Code	Course Title	Course Category	L+T+P	CA	EE	Total	Credit
BCA601	Data Science	CC16	5+1+0	50	100	150	6
BCA602	Java Programming	CC17	3+1+0	30	70	100	4
BCA603	Power BI	AECC5	1+1+0	15	35	50	2
BCA*	DSE	DSE2	3+1+0	30	70	100	4
PRACTICAL / PROJECTS							
BCA652	Java Programming Lab	CC17(P)	0+0+4	15	35	50	2
BCA653	Major Project	DSE3	0+0+16	60	140	200	8
TOTAL			**12+4+20**	**200**	**450**	**650**	**26**

*** Discipline Specific Elective (DSE) 2 List**			
S.No	**Code**	**DSE**	**Subject Name**
1	BCA614	DSE2	Artificial Neural Network
2	BCA615	DSE2	E-Business with Security Issue
3	BCA616	DSE2	Data and Network Security
4	BCA617	DSE2	Advanced SQL Programming

*** Discipline Specific Elective (DSE) 3 List**			
S.No	**Code**	**DSE**	**Subject Name**
1	BCA653	DSE3	Major Project

Ability-Enhancement Compulsory Course (AECC) 5 LIST			
S.No	**Code**	**AECC LIST**	**Subject Name**
1	BCA603	AECC5	Power BI

Skill-Enhancement Elective Courses (SEC) LIST			
S.No	**Code**	**SEC LIST**	**Subject Name**
1	BCA105	SEC1	Information Security Fundamentals
2	BCA204	SEC2	E-Commerce
3	BCA304	SEC3	Management Information System
4	BCA403	SEC4	Cloud Computing

BCA101: Environment & Ecology						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	0	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: - General knowledge of Ecology and Environment Biotechnology

Course Objectives:

1. Investigate the complexities of the natural environment and our relationship with it.
2. Explore the problems we face in understanding our natural environment and in living sustainability.
3. Develop scientific, interpretive and creative thinking skills.
4. Learn to apply quantitative analysis and field research techniques.
5. Use computer-based geographical information systems to study environmental change.

Detailed Syllabus

UNIT-1 **Introduction-** Definition, Scope & Importance, Need for Public Awareness- Environment definition, Eco system Balanced ecosystem, Human activities – Food, Shelter, Economic and social Security. Effects of human activities on environment-Agriculture, Housing, Industry, Mining and Transportation activities, Basics of Environmental Impact Assessment.
UNIT-2 **Natural Resources-** Water Resources- Availability and Quality aspects. Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material cycles- Carbon, Nitrogen and Sulphur Cycles. Energy – Different types of energy, Electro-magnetic radiation. Conventional and non-conventional sources – Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Bio-gas. Hydrogen as an alternative future source of Energy.
UNIT-3 **Environmental Pollution and their effects-** Water pollution, Land pollution. Noise pollution, Public Health aspects, Air Pollution, Solid waste management. Current Environmental Issues of Importance: Population Growth, Climate Change and Global warming- Effects, Urbanization, Automobile pollution. Acid Rain, Ozone Layer depletion, Animal Husbandry. Environmental Protection- Role of

Government, Legal aspects, Initiatives by Non-governmental Organizations (NGO), Environmental Education, Women Education.

Text and Reference Books

1. Benny Joseph – "Environmental Studies" –Tata McgrawHill-2005
2. Dr. D.L. Manjunath, "Environmental Studies" –Pearson Education-2006.
3. R. Rajagopalan – "Environmental studies" –Oxford Publication – 2005.
4. M. Anji Reddy – "Text book of Environmental Science & Technology" –BS Publication. .

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the structure and function of ecological systems and their relevance to environmental sustainability.
CO2: Analyze the causes and effects of environmental pollution and evaluate control measures to protect natural resources.
CO3: Demonstrate awareness of environmental policies, laws, and practices for sustainable development at local, national, and global levels.
CO4: Evaluate the role of biodiversity and conservation strategies in maintaining ecological balance.
CO5: Apply knowledge of renewable and non-renewable resources to suggest practical solutions for environmental challenges.

BCA102: Digital Electronics and Computer Organization						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
6	0	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 Computers Fundamentals and Physics of Intermediate standard.

Course Objectives:

1. To describe various types of Number System, basic electronic components and hardware components of computer system.
2. To understand the concept of Boolean algebra, types of digital circuits, memories, addressing modes and I/O interface.
3. To solve problems related to number system conversions and calculation of binary codes.
4. To implement basic Boolean expressions using different Digital Electronic device.
5. To distinguish between types of digital circuits, addressing modes, memories and I/O interface.
6. To design digital circuits for a particular functions using basic electronic concept.

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-2 **Binary Arithmetic-** Binary Addition and Subtraction. Complements and Subtraction using complements, Multiplication, Division. **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-3 **Logic Gates-** Primary and Secondary Logic Gates, Designing of circuits using gates, Universal Gates, Implementation of circuits using NAND and NOR.

Unit-4 **Combinational Circuits- Half** and Full Adder, Half and Full Subtract or, CLA, Multiplexer, De-multiplexer, Encoder and Decoder. Implementation using MUX and decoder. **Sequential Circuits-** Latch, Flip-flop, Introduction to RS flip-flop, J-K flip-flop D-type flip-flop, T flip-flop.
Unit-5 **Processor Organization-** Introduction and types of CPU Organization, addressing modes, Implied Addressing Mode, Immediate Addressing Mode, Register Addressing Mode, register indirect Addressing Mode, Direct Addressing Mode, Indirect Addressing Mode, Relative Addressing Mode, index Addressing Mode, auto increment/decrement Addressing Modes. **I/O Organization -** Introduction to I/O organization, I/O interface and its need.
Unit-6 **Memory Organization-** Memory Hierarchy, RAM and ROM chips, SRAM, DRAM, PROM, EEPROM, Introduction of Cache Memory and Virtual Memory.

Text and Reference Book

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

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental principles of number systems, binary arithmetic, and logic gates used in digital circuits.
CO2: Design and analyze combinational circuits such as adders, multiplexers, encoders, and decoders.
CO3: Explain the operation and applications of sequential circuits including flip-flops, counters, and shift registers.
CO4: Understand the basic structure, functioning, and organization of computer systems, including CPU, memory, and input-output devices.
CO5: Analyze instruction formats, addressing modes, and assembly-level programming concepts in computer architecture.

BCA103: 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: Boolean Algebra, Number System and basic mathematical formulas

Course Objectives:

1. To learn fundamentals of C Programming, Operators and Control Statements in C.
2. To understand usage of loop statements, arrays and strings in C Programming.
3. To learn the fundamentals of pointers, usage of pointers, memory allocation and functions in C Programming.
4. To understand the visibility and scope of variables on the basis of storage classes and defining user defined data types using structure, unions and enums in C Programming.
5. To learn how to handle a file using C Programs and fundamentals of an Operating System (Linux) Programming.

Detailed Syllabus

Unit I (10 Hours) **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 II (10 Hours) **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 III (10 Hours)

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 IV (10 Hours)

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.

Unit V (8 Hours)

Strings: Definition, declaration and initialization, standard library functions. Pointer and Strings, Two-Dimensional array of characters, Array of Pointers to String.

Unit VI (10 Hours)

File Handling: File, File operations, Opening and Closing Files, File opening modes, Reading and Writing a data file, Text files v/s Binary files, Command Line Arguments (argc, argv), sprintf() & sscanf(), gets() & puts(), fgetc() & fputc(), fseek() & ftell(), Creation of user header file.

Text and Reference Books

1. Rajaraman V. Fundamental of Computers
2. Ram B. Computer Fundamentals, New Age International
3. Gottfried - Programming with C Schaum
4. Kanetkar Y. - Let us C
5. Balaguruswamy - Programming in C

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamentals of C programming, including data types, operators, expressions, and input/output operations.
CO2: Apply control structures such as decision-making, looping, and branching to solve computational problems.
CO3: Develop programs using functions, recursion, and arrays for efficient modular programming.
CO4: Utilize pointers, structures, and unions to handle complex data manipulation and memory management.
CO5: Implement file handling techniques to read from and write to files for data storage and retrieval.

BCA104: Introduction to MS-Office 365						
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: - Fundamentals of computers

Course Objectives:

1. Introduce students to the essential features of Microsoft Office Suite, including Word, Excel, and PowerPoint.
2. Focus on practical skills development and hands-on learning.
3. Teach students to create professional documents, spreadsheets, and presentations.
4. Develop proficiency in using Microsoft Office tools for various tasks, including document creation, data analysis, and presentations.
5. Provide students with the skills and knowledge necessary to create a professional resume and statement of purpose.

Detailed Syllabus

Unit-1 **Introduction of Computer Basics:** Introduction of Computer, Creating Folder, Directories, Input and Output devices, Central Processing Units, Hardware and Software, Operating System, Functions of Operating Systems. **Working with Windows Operating System:** Introduction, The Desktop, Structure of Windows, Windows Explorer, File and Folder Operations, The Search, The Recycle Bin.
Unit-2 **Introduction of Ms-Office:** Formatting Text, Find and Replace, working with Paragraphs, Inserting Tables, Performing Calculations in Tables, Formatting Tables, Inserting Pictures, Document Background, Page Layout, Printing Documents, Mail Merge, Watermark, Page border.
Unit-3 **MS-Word:** Creating, editing, saving and printing text documents, Font and paragraph formatting, Simple character formatting, inserting tables, smart art, page breaks, using lists and styles, working with images, Using Spelling and Grammar check, Understanding document properties, Mail Merge.

Unit-4

Microsoft Excel: Creating Workbooks, Moving Data within a Workbook, Finding and Replacing Data, Perform Basic Calculations on Data, Creating Basic Formulas, Finding and Correcting Errors in Calculations, Filters, PivotTables, Creating Charts and Graphics, Printing Parts of Worksheets, Creating and Modifying Macros, Protecting Workbooks and Worksheets.

Unit-5

Microsoft PowerPoint: Creating a Presentation, Changing the Slide Size & Orientation, Adding, Deleting, and Rearranging Slides, Views, Text Formatting, Adding Tables, SmartArt, Charts, and Hyperlinks to Slides, Adding Movies and Sounds to a Presentation, Slide Transitions and Animations, Inserting Charts, Drawing Shapes. Microsoft Access: Working in Access, Database Concepts, Exploring Tables, Forms, Queries, Reports, Creating Databases from Templates, Creating Databases and Tables Manually, Manipulating Table Columns and Rows, Refining Table Structure, Creating Forms.

Unit-6

Microsoft Outlook: Send and receive email messages, attach files and Outlook items to messages, display messages and message attachments, Display message participant information.
Internet: Overview of the Internet and its evolution, Internet protocols, Email addressing, Email attachments, Search engines.

Text and Reference Book

1. Rajaraman V. Fundamental of Computers
2. Computer Fundamentals, P.K. Sinha, BPB Publication, November, 2004..
3. Ram B. Computer Fundamentals, New Age International.
4. Computer Fundamental and Concepts, V. Raja Raman, PHI, 4 th Edition, January 2010.
5. Go! With Microsoft Office 2013, Shelly Gaskin et.al., Volume 1, 1st Edition
6. Office 2007 All-in-One Desk Reference for Dummies, Wiley, 2007.
7. Microsoft Office Home and Student 2010, Microsoft Press, 2010.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the features and functionalities of MS-Office 365 and its cloud-based productivity tools.
CO2: Create, edit, format, and manage professional documents using MS Word 365.
CO3: Develop and analyze structured data using MS Excel 365, including functions, formulas, charts, and pivot tables.
CO4: Design and deliver engaging presentations using MS PowerPoint 365 with animations, transitions, and multimedia integration.
CO5: Collaborate effectively using MS Office 365 tools such as OneDrive, Outlook, Teams, and SharePoint for file sharing and communication.

BCA105: Information Security Fundamentals						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
4	0	0	70	30	0	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: 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.

UNIT IV (10 Hours)

Internet Security: LAN Security, Email Security, Hacking attacks, preventive measures, Introduction to Internet Security, Common Internet Threats (Viruses, Malware, Phishing), HTTPS and SSL/TLS, Password Security and Management, Two-Factor Authentication (2FA), Firewalls and Internet Security Software, Virtual Private Networks.

UNIT V (8 Hours)

Risk Assessment: Introduction to Risk Assessment, Risk Analysis Techniques, Risk Mitigation Strategies, Risk Management Frameworks, Understanding Vulnerabilities and Threats.
Cyber Laws: Overview of Cyber Laws, Data Protection Laws, Intellectual Property Rights in Cybersecurity, Privacy Laws and Regulations, Cybercrime and Legal Framework.

UNIT VI (10 Hours)

Security Auditing: Security Auditing Basics, Types of Security Audits, Audit Objectives, Audit Planning, Security Controls, Internal vs. External Audits, Compliance Audits, Risk-Based Auditing, IT Infrastructure Audits, Network Security Audits, Application Security Audits, Access Control Audits, Data Security Audits.

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)
5. 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.

BCA201: Operating Systems

L	T	P	Theory	Internal	Total Marks
Hours					
5	1	0	100	50	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, Data Structures, 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. Operating System Concepts & Design, MilenKovic, TMH publication, 2001.
3. Operating System Concepts, Sibsankar, Halder, Pearson Education, 2009.
4. Operating Systems, Deitel H.M, Addison Wesley, 2nd Edition.
5. Operating Systems, Stalling W, Prentice Hall, 4th Edition.
6. Operating System Concepts, Tanenbaum, Prentice Hall, 3rd.

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.

BCA202: Python Programming					
L	**T**	**P**	**Theory**	**Internal**	**Total Marks**
Hours					
3	1	4	70	30	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

GETTING STARTED: History & need of Python, Application of Python, Advantages of Python, Disadvantages of Python, Installing Python, Program structure, Interactive Shell, Executable or script files, User Interface or IDE
PYTHON FUNDAMENTALS Working with Interactive mode, Working with Script mode, Python Character Set Python Tokens, Keywords, Identifiers, Literals, Operators, Variables and Assignments, Input and Output in Python. DATA HANDLING Data Types Numbers, Strings, Lists, Tuples Dictionary Set, Frozenset, Bool, Mutable and Immutable.

Unit-2

STRING MANIPULATION Introduction to Python String, Accessing Individual Elements, String Operators, String Slices, String Functions and Methods.
LIST MANIPULATION Introduction to Python List, Creating List, Accessing List, Joining List, Replicating List, List Slicing.
TUPLES Introduction to Tuple, Creating Tuples, Accessing Tuples, Joining Tuples, Replicating Tuples, Tuple Slicing.
DICTIONARIES Introduction to Dictionary, accessing values in dictionaries, Working with dictionaries Properties.
SET AND FROZENSET Introduction to Set and Frozenset, Creating Set and Frozenset, Accessing and Joining, Replicating and Slicing. OPERATORS Arithmetic Operators, Relational Operators,

Logical Operators, Membership Operators, Identity Operators, Bitwise Operators, Assignment Operators, Operators Precedence, Evaluating Expression, Type Casting.

Unit-3

PROGRAM CONTROL FLOW Conditional Statements The if Statement, The if-else Statement, The if-elif Statement, The if-elif Statement, Nested if Statements, Python Indentation, Looping and Iteration, The For Loop, The While Loop, Loop else Statement, Nested Loops, Break and Continue, The Range Function, Introduction to range(), Types of range() function, Use of range() function.
INTRODUCTION TO FUNCTIONS Built-In Functions, Introduction to Functions, Using a Functions, Python Function Types, Structure of Python Functions, E.g. - map, zip, reduce, filter, any, chr, ord, sorted, globals, locals, all, etc.
USER DEFINED FUNCTIONS Structure of a Python Program w.r.t. UDF, Types of Functions, Invoking UDF, Flow of Execution, Arguments and Parameters, Default Arguments, Named Arguments, Scope of Variables, Lambda function.
RECURSION FUNCTION Use of recursion function.

Unit-4

MODULES AND PACKAGES Built-in Modules, Importing Modules in Python Programs, Working with Random Modules, E.g. – built-ins, OS Module, time, datetime.
USER DEFINED MODULES Structure of Python Modules.
FILE OPERATIONS Text and Bytes files, Opening a file, Reading and Writing Files, Other File tools.

Unit-5

JSON/PICKLE FORMAT CLASSES AND OBJECTS Classes as User Defined Data Type, Objects as Instances of Classes, Creating Class and Objects, Creating Objects by Passing Values Variables & Methods.
EXCEPTION HANDLING Default Exception and Error, Catching Exceptions, Raise an exception, Try...except statement Raise, Assert, Finally blocks.

Unit-6

INTRODUCTION TO OOPS Procedural Vs Modular Programming, The Object Oriented Programming, Data Abstraction, Data Hiding, Encapsulation, Inheritance, Polymorphism, Generators, Iterators. DATABASE Introduction to MySQL, PYMYSQL Connections, Executing queries, Transaction Handling error.
LIBRARY Introduction to NumPy, Introduction to Pandas and Matplotlib.

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.

BCA203: Computer Graphics

L	T	P	Theory	Internal	Total Marks
Hours					
3	1	4	70	30	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-5

Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms-Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

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.

BCA204: E-Commerce

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

Course Objectives:

1. Understand the foundational concepts and types of e-commerce.
2. Develop skills to implement technical infrastructure for online businesses.
3. Analyze legal and regulatory requirements for e-commerce operations.
4. Apply digital marketing strategies for customer acquisition and retention.
5. Evaluate emerging technologies and trends in the e-commerce landscape.

Detailed Syllabus:

Unit - 1 **Introduction of E-Commerce :** Definition of E- Commerce, , Advantages and Disadvantages Traditional Commerce, Basic Requirements of E-Commerce, Architectural framework, Impact of E-commerce on business, Technology and Prospects, Electronic Commerce framework , Economic potential of Electronic Commerce, Forces Behind E-Commerce, E-commerce Organization Applications.
Unit - 2 **Network Infrastructure for E- Commerce:** Internet, Intranet and Extranet based E-commerce-Issues, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, and CELL RELAY and FRAME RELAY), Global Information Distribution Networks.
Unit - 3 **Web Security:** Security Issues on Web, Importance of Firewall, Components of Firewall, and Transaction security, Client Server Network Security, Firewall and Network Security, Limitation of Firewalls. **Electronic Payments:** E-Payment System, Digital Tokens, Smart card, credit card, E-Checks, Credit/Debit card based EPS, online Banking. Payment Gateway, the SET Protocol, Certificate. EDI Application in Business, EDI S/W Implement, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

Suggested Readings:

Text Book:

1. Ravi Kalakota, Andrew Winston ,"Frontiers of Electronic Commerce", Pearson Education Asia, 2010 edition.

Reference Books:

1.Jeffery F. Rayport, Bernard J.Jaworski , "E-commerce", TMCH, 2002
2.E.Frami Turban, JAE Lee, David King, K.Michale Chung, "Electronic Commerce", Pearso Education,2000

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts, models, and frameworks of E-Commerce and its role in modern business environments.
CO2: Analyze the technological infrastructure required for E-Commerce, including internet technologies, electronic payment systems, and security protocols.
CO3: Evaluate the impact of E-Commerce on business strategies, customer relationships, and supply chain management.
CO4: Identify and apply legal, ethical, and regulatory considerations related to online business and digital transactions.
CO5: Demonstrate the ability to plan, design, and evaluate E-Commerce websites and platforms for various business models (B2B, B2C, C2C).

BCA205: 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:

1. To understand the concepts, process and importance of communication.
2. To equip students with verbal and non-verbal communication skills.
3. To enhance their communication skills in real life situations.
4. To develop awareness regarding appropriate communication and presentation skills.
5. To encourage students by developing their critical thinking through activities.
6. To assist students with employability and job search skills.

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 P's 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.

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 the role of industrial applications in various domains such as manufacturing, automation, healthcare, logistics, and IT services.
CO2: Identify and explain the use of software and hardware tools commonly employed in industrial environments.
CO3: Analyze real-world industrial problems and apply suitable IT solutions using current technologies.
CO4: Demonstrate the ability to integrate theoretical knowledge with practical tools for process improvement and system efficiency.
CO5: Develop and present case studies or project reports based on industrial application scenarios, showcasing problem-solving and critical thinking skills.

BCA216*: Remedial Mathematics *(Qualifying)*						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	0	70	30	0	100

Teaching Scheme	**Examination Scheme**
Credits: 0 ***(Qualifying)***	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Course Objectives:

1. Become confident in using mathematics to analyze and solve problems both in university and in real-life situations
2. Appreciate the logic and basics of mathematics
3. Enjoy mathematics and develop patience and persistence when solving problems in mathematical domain.
4. Understand and be able to use the language, symbols and notation of mathematics
5. Develop mathematical curiosity and use inductive and deductive reasoning when solving problems
6. Recognize that mathematics permeates the world around us.
7. Develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics

Detailed Syllabus:

Unit I (10 hours) **Quadratic Equations:** Quadratic equation, nature of the roots of a quadratic equation, relation between roots and coefficients, formation of a quadratic equation with given roots, solution of equations reducible to quadratic forms.
UNIT - II (10 Hours) **Matrices:** Addition, Subtraction, Multiplication, Inverse of matrices, Simultaneous equation by matrices.
UNIT - III (10 Hours) **System of Coordinates:** Certain co-ordinates, distance between two parts, area of triangle, locus of points, straight line, intercept form in normal.
UNIT - IV (10 Hours) **Differential Calculus:** Definition and formulation of differential calculus, Rules of standard form of differential calculus, Chain Rule, Parametric rule.
UNIT - V (10 Hours) **Integral Calculus:** Standard form of Integral calculus, Partial fraction of Integral, Trigonometric function of Integral calculus.

UNIT - VI (10 Hours)

Linear Differential equations: Linear differential equation of order greater than one with constant coefficient complimentary function, and particular Integral.

Text Books:

1. Data Communications and Networking, Behrouz A. Forouzan , Fourth Edition TMH,2006.
2. Computer Networks, Andrew S Tanenbaum, 4th Edition. Pearson Education, PHI.

References:

1. Data communications and Computer Networks, P.C .Gupta, PHI.
2. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.
3. Understanding communications and Networks, 3rd Edition, W.A. Shay, Cengage Learning.
4. Computer Networking: A Top-Down Approach Featuring the Internet. James F.Kurose & Keith W. Ross, 3 rd Edition, Pearson Education.
5. Data and Computer Communication, William Stallings, Sixth Edition, Pearson Education, 2000.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand and apply the concepts of basic algebra, including linear equations, quadratic equations, and polynomials.
CO2: Solve problems involving basic trigonometric functions, identities, and equations relevant to real-world applications.
CO3: Analyze and interpret coordinate geometry concepts such as straight lines, slopes, and distances in a 2D plane.
CO4: Demonstrate the use of matrices and determinants in solving systems of linear equations and related operations.
CO5: Apply basic concepts of calculus, including limits, derivatives, and their applications in rate of change and graph analysis.

BCA301: Database Management Systems						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	0	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. To introduce the fundamental concepts of database systems, data models, and database architecture.
2. To provide knowledge of relational databases, SQL, and techniques for effective data storage, retrieval, and manipulation.
3. To develop an understanding of database design using Entity-Relationship (ER) modeling and normalization techniques.
4. To enable students to implement and manage databases with attention to data integrity, security, and transaction management.

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.

BCA302: Data Structures						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	0	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: - Programming languages, Data Structures, 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. Operating System Concepts & Design, MilenKovic, TMH publication, 2001.
3. Operating System Concepts, Sibsankar, Halder, Pearson Education, 2009.
4. Operating Systems, Deitel H.M, Addison Wesley, 2nd Edition.
5. Operating Systems, Stalling W, Prentice Hall, 4th Edition.
6. Operating System Concepts, Tanenbaum, Prentice Hall, 3rd.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts of data structures and their importance in algorithm design and software development.
CO2: Implement linear data structures such as arrays, linked lists, stacks, and queues for various computational problems.
CO3: Apply non-linear data structures like trees and graphs to solve hierarchical and network-based problems.
CO4: Analyze and compare the efficiency of different sorting and searching algorithms in terms of time and space complexity.
CO5: Choose appropriate data structures for problem-solving and develop efficient solutions using structured and modular programming techniques.

BCA303: 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.

BCA304: Management Information System						
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 Computer Applications
2. Understanding of Business Fundamentals

Course Objectives:

1. To introduce the fundamental concepts and components of Management Information Systems.
2. To develop an understanding of the role of information systems in organizations.
3. To familiarize students with various types of information systems.
4. To provide insight into current trends and issues in MIS,

Unit-1: Introduction to MIS and Information Systems Definition, Nature, and Scope of MIS, Components of MIS: People, Data, Processes, Hardware, Software Types of Information Systems: Transaction Processing Systems (TPS), Management Information Systems (MIS), Decision Support Systems (DSS), Executive Information Systems (EIS), Role of MIS in Decision Making, Strategic Role of MIS in Organizations, Challenges in MIS Implementation
Unit-2: Information System Development and Technologies System Development Life Cycle (SDLC) in MIS, Approaches to System Development: Waterfall, Agile, Prototyping, Database Management Systems in MIS, Enterprise Resource Planning (ERP): Features, Benefits, and Modules, E-Commerce and E-Business Systems, Cloud Computing and its Impact on MIS.
Unit-3: MIS Applications, Security, and Ethical Issues Applications of MIS in Various Business Functions: Marketing, Finance, HR, Production, and Supply Chain, Information System Security: Threats, Controls, and Safeguards, Ethical and Social Issues in MIS, Emerging Trends in MIS: Big Data, AI in MIS, Business Intelligence (BI), Case Studies on MIS Success and Failure in Organizations.

Text and Reference Books:

1. Management Information Systems, Kenneth C. Laudon & Jane P. Laudon, Pearson Education
2. Management Information Systems: Managing the Digital Firm, James A. O'Brien, George M. Marakas & Ramesh Behl, McGraw-Hill Education
3. Information Systems for Managers, G.R. Basandra, Wiley India
4. Management Information Systems, W.S. Jawadekar, Tata McGraw-Hill

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the core concepts, structure, and roles of Management Information Systems in supporting business operations and decision-making.
CO2: Analyze various types of information systems such as TPS, MIS, DSS, and ERP, and their applications in different business functions.
CO3: Apply knowledge of system development methodologies and emerging technologies to evaluate or design effective information systems.
CO4: Assess the importance of information security, ethical issues, and legal considerations in managing digital information.
CO5: Evaluate real-world MIS implementations through case studies and demonstrate the ability to align MIS strategies with organizational goals.

BCA315 (GE): Numerical and Statistical Techniques						
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. 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 analyze 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, Stirlling'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.

BCA316 (GE): Engineering Mathematics						
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 Understanding of Higher Secondary Mathematics.
2. Analytical and Logical Thinking Skills.

Course Objectives:

1. To build a strong foundation in fundamental mathematical concepts.
2. To develop the ability to formulate and solve mathematical models.
3. To enhance analytical thinking and problem-solving skills.
4. To prepare students for advanced courses in engineering and technology

Detailed Syllabus

Unit-1 **Limit and Continuity Differentiability:** Limit, Continuity, Differentiability of one variable for real numbers systems. Algebra of continuous functions, Continuity of composite functions. Continuity for open and closed intervals.
Unit-2 **Sequences:** Sequence of real number systems, Convergent, Divergent, Oscillatory sequences, Bounded sequences and theorems, Monotonic sequence, Subsequence, Limit Superior and Inferior. **Infinite Series:** Convergence and Divergence of an infinite series, P-test series, Comparison test, D' Alembert test, Cauchy's nth root test, Raabe's test, Logarithmic test, Higher logarithmic test, De Morgan & Bertrand's test.
Unit-3 **Indeterminate forms:** L's Hospital Rule (without proof). Rolle's Theorem, Lagrange's Mean Value

Theorem, Cauchy's Mean Value Theorem. Expansion of functions by Maclaurin's & Taylor's for single variables.

Text and Reference Books:

1. Advanced Engineering Mathematics, E.Kreyszig, John Wiley & Sons, 2005.
2. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2006.
3. Calculus, George B. Thomas, Ross L. Finney, Pearson Publications, 9th Edition, 1996.

Course Outcomes:

After completing the course, students will be able to:

CO1: Apply differential and integral calculus to solve engineering problems involving rates of change and areas under curves.
CO2: Solve systems of linear equations and perform matrix operations applicable to engineering computations and data analysis.
CO3: Use vector calculus to analyze physical quantities involving direction and magnitude, such as force fields and fluid flow.
CO4: Apply Laplace transforms and differential equations to model and solve dynamic systems in engineering.
CO5: Analyze and solve problems using complex numbers, sequences, and series relevant to electrical and communication engineering.

BCA401: 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.

BCA402: GUI using .Net Framework						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	0	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 There 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.

BCA403: Cloud Computing						
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. Fundamentals of Operating Systems and Virtualization.
2. Basic Knowledge of Computer Networks.

Course Objectives:

1. To introduce the fundamental concepts and architecture of cloud computing.
2. To provide knowledge about virtualization and its role in enabling cloud services.
3. To familiarize students with various cloud platforms and technologies.
4. To develop an understanding of cloud security, resource management, and cost optimization strategies

Detailed Syllabus

Unit-1

Introduction: Recent trends in computing, Introduction to Grid Computing: Motivation, Definition of Grid Computing, Evolution of Grid, Examples and Usages, Research Possibilities, Benefits of Grid Computing.

Grid Basics: Grid Architecture and its relationship to other distributed technologies, Grid Application Areas. **Security Issues in Grids:** Kerberos, GSI and Grid Security Framework. Migrating to Cloud.

Unit-2

Cloud Computing Basics- Cloud Computing Overview, Characteristics, Applications, Components, Benefits, Limitations, Challenges. First Movers in Cloud.

Cloud Computing Technology: Hardware and Infrastructure, Clients, Security, Network, Services.

Unit-3

Cloud Deployment Models: Private Cloud; Public Cloud; CommUnity Cloud; Hybrid Cloud.

Cloud Computing Service Models: Infrastructure as a Service; Platform as a Service; Software as a Service. **Accessing the Cloud:** Web Applications, Web API's, and Web Browsers.

Cloud Storage and Security: Overview, Advantages, Storage as a Service, Security, Reliability, Advantages, Cautions, Theft, Cloud Storage Providers. **Standards:** Applications, Client, Infrastructure, Services.

Text and Reference Books

1- The Grid- Blueprint for a New Computing Infrastructure, Ian Foster, Carl Kesselman, 2nd Edition, Morgan Kaufmann Publications,2003.

2- Grid Computing: Making the Global Infrastructure a Reality, Francine Berman, Geoffrey Fox, Tony Hey, John Wiley & Sons, 2003.

3- Cloud Computing: Principles and Paradigms, Rajkumar Buyya and James Broberg, John Wiley & Sons, 2011.

4- Cloud Computing, A Practical Approach, Anthony T Velte, Mc Graw Hill, 2010.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts, architecture, and service models of cloud computing.
CO2: Explain the role of virtualization in cloud environments and how it supports scalable and flexible computing resources.
CO3: Identify and compare major cloud service providers (e.g., AWS, Azure, GCP) and their core services.
CO4: Apply cloud deployment and management techniques for building, testing, and deploying cloud-based applications.
CO5: Analyze cloud security challenges and implement basic strategies for data protection, access control, and cost management in the cloud.

BCA404: Responsive Web Design-Front End Development

L	T	P	Theory	Internal	Total Marks
Hours					
3	1	0	70	30	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.

Module I: Introduction to HTML

What is HTML: Definition and purpose of HTML, Role of HTML in web development, Basic syntax and structure
Setting Up Your Development Environment: Text editors (VS Code, Sublime, Notepad++), Browser for testing HTML (Google Chrome, Firefox)
First HTML Page: Creating and saving a basic HTML document, Introduction to <!DOCTYPE html> and basic document structure, Tags: <html>, <head>, <body>
Head Section: The <meta> tag, The <title> tag, The importance of the <head> section
Body Section: Basic text elements: <h1> to <h6>, <p>, <b>, <i>, Paragraphs, line breaks, and horizontal rules, Lists: Ordered (<ol>) and unordered (<ul>) lists, list items (<li>)
Hyperlinks and Images: Creating hyperlinks with <a> tag, Attributes: href, target, title, Adding images with <img> tag, Attributes: src, alt, width, height
Forms and Input Elements: Creating forms: <form> tag, Form elements: <input>, <textarea>, <select>, <button>, Basic form attributes: action, method, name, id
Tables: Table tags: <table>, <tr>, <th>, <td>, Styling tables: border, cellspacing, cellpadding
Multimedia Elements: Embedding audio: <audio>, Embedding video: <video>, Using <source> tag for multiple file formats
Iframes and Embeds: Creating iframes with <iframe>

MODULE II: HTML5 AND Advanced HTML5 Features

HTML5 Overview: Introduction to HTML5 features, Key differences between HTML5 and previous versions, Benefits of HTML5 for modern web development
Semantic HTML5 Tags: Introduction to semantic tags: <header>, <footer>, <nav>, <article>, <section>, <aside>, etc.
Audio and Video Elements in HTML5: Using <audio> and <video> tags, Supporting multiple file formats and fallback methods
Forms in HTML5: New input types: email, date, number, range, url, etc., New attributes: required, placeholder, autofocus, pattern, Creating a form with new HTML5 inputs
Local Storage and Session Storage: Introduction to local storage and session storage, Storing and retrieving data with JavaScript, Use cases for local storage in web applications
HTML5 Canvas: Introduction to <canvas> element, Drawing basic shapes and graphics with JavaScript, Animation basics using canvas

MODULE-III: Mastering CSS3

What is CSS: Definition and purpose of CSS, The role of CSS in web development, How CSS works with HTML to style web pages
CSS Syntax and Structure: CSS rule sets: selectors, properties, and values, Basic syntax: selector { property: value; }, Inline, internal, and external CSS
How to Link CSS to HTML: Inline CSS using the style attribute, Internal CSS within the <style> tag, External CSS with the <link> tag
CSS Selectors: Element selectors (e.g., h1, p), Class selectors (e.g., .class-name), ID selectors (e.g., #id-name), Universal selector (*), Descendant, child, and sibling selectors, Attribute selectors (e.g., [type="text"])
CSS Properties: **Text styling:** color, font-family, font-size, line-height, font-weight, text-align, **Box model:** width, height, margin, padding, border, box-sizing, **Backgrounds:** background-color, background-image, background-position, background-repeat
Understanding the Box Model: Content, padding, border, and margin, Box-sizing property (content-box, border-box), Visualizing the box model using browser developer tools
Layout Techniques: Static vs. relative vs. absolute positioning, Floating elements and clearing floats, Centering elements using margin auto, Fixed positioning and sticky positioning
CSS3 Transitions: What are CSS transitions?, Transition properties: transition-property, transition-duration, transition-timing-function, transition-delay, Example: Hover effect with transitions
CSS3 Animations: Introduction to keyframes, Creating animations with @keyframes, Animation properties: animation-name, animation-duration, animation-timing-function, animation-delay, animation-iteration-count, Practical examples of animations
CSS3 Transforms: transform property: rotate, scale, translate, skew, 2D vs. 3D transforms, Transforming elements on hover (interactive effects)

MODULE-IV: CSS3 Responsive Design

Introduction to Responsive Web Design (RWD): What is responsive design?, Importance of mobile-first design, Viewport meta tag and its importance in mobile optimization
Media Queries: Syntax of media queries, Targeting different devices and screen sizes, Example: Mobile-friendly layout using media queries
Fluid Layouts and Flexible Boxes: Using percentages for fluid widths, Introduction to Flexbox: Basic layout with display: flex, Flexbox properties: justify-content, align-items, flex-wrap, flex-grow, flex-shrink, flex-basis
CSS Grid Layout: Introduction to the CSS Grid system, Defining grid containers with display: grid, Creating rows and columns with grid-template-rows, grid-template-columns, Aligning grid items using justify-items, align-items, and place-items, Example: Building a responsive grid layout
CSS Flexbox and Grid Combined: Combining Flexbox and Grid for complex layouts, Practical use case: Building a multi-column layout with both Flexbox and Grid
Custom Properties (CSS Variables): Introduction to CSS custom properties (variables), Defining and using variables: --primary-color, etc., Benefits of using CSS variables in themes and design consistency
Hover and Focus Effects: Styling links and buttons on hover and focus, Changing background colors, borders, and text styles, Example: Button hover effects with transitions
CSS Shadows and Glows: Box shadows: box-shadow property, Text shadows: text-shadow property, Using multiple shadows in one property, Creating glowing effects with shadows
Gradients and Patterns: Linear gradients: background: linear-gradient (), Radial gradients: background: radial-gradient(), Repeating gradients and patterns, Example: Background gradient animations
Styling Form Elements: Basic form styles: input fields, buttons, and labels, Input types and custom styles for text, password, email, number, etc., Placeholder and focus effects
Customizing Form Controls: Styling checkboxes, radio buttons, and select dropdowns, Custom form controls with appearance property, Example: Custom form controls with CSS
CSS3 Validation Styles: Styling invalid and valid form inputs, Using the: valid, invalid, required, and: focus pseudo-classes

MODULE-V: Mastering JavaScript

What is JavaScript: Definition and role of JavaScript in web development, JavaScript's relationship with HTML and CSS, Running JavaScript: Inline, Internal, and External JavaScript
JavaScript Syntax Basics: Variables: let, const, and var, Basic data types: string, number, boolean, null, undefined, Simple operators: +, -, *, /, %, ++, --, Comments: single-line and multi-line comments
Conditional Statements: if, else if, else, switch statement
Loops: for loop, while loop, do...while loop, for...of and for...in loops, Loop control: break, continue
Functions: Function declaration and invocation, Parameters and arguments, Return values, Function expressions and arrow functions (() => {}), Scope: Local and Global, Closures and higher-order functions
Arrays: Declaring arrays: let arr = [], Array methods: push(), pop(), shift(), unshift(), slice(), splice(), map(), filter(), reduce(), Accessing and iterating through arrays: for, forEach()
Objects: Declaring objects: let obj = { key: value }, Accessing and modifying object properties: dot notation and bracket notation, Iterating through objects: for...in loop, Object.keys(), Object.values()

Introduction to the DOM: What is the DOM? (Document Object Model), Accessing elements by ID, class, tag, and query selectors, Modifying content and attributes: innerHTML, textContent, setAttribute()
Event Handling: Adding event listeners: addEventListener(), Handling different events: click, mouseover, keydown, etc., Event propagation: event bubbling and event capturing
ES6+ Features: Let and const vs. var, Arrow functions and the this keyword, Template literals (String interpolation): `Hello, ${name}!`, Default parameters in functions, Modules: import and export
Asynchronous JavaScript: Callbacks, Promises: then(), catch(), finally(), Async/Await: Simplifying asynchronous code
Error Handling in JavaScript: try...catch block, Throwing errors with throw, Custom error messages, Handling asynchronous errors
Debugging JavaScript: Using browser dev tools (Console, Sources, Breakpoints), Common debugging techniques, Debugging asynchronous code

MODULE-VI: Mastering Bootstrap

What is Bootstrap: Overview of Bootstrap and its importance, Advantages of using Bootstrap for responsive web design, Installing Bootstrap (via CDN and local setup)
Setting Up Your Development Environment: Text editors: VS Code, Sublime Text, etc., Browsers and developer tools for testing, Linking Bootstrap to your project: CDN vs. downloading
Bootstrap Grid System: Understanding the 12-column grid layout, Defining rows and columns with .row and .col-*, Creating responsive layouts using grid breakpoints, Nesting grid columns for advanced layouts
Typography: Bootstrap's default typography styles (headings, paragraphs, lists), Font styles and text alignment: .text-center, .text-left, .text-right, Typography utilities: .font-weight-bold, .text-uppercase, etc.
Buttons: Button classes: .btn, .btn-primary, .btn-success, .btn-danger, Button sizes and block buttons, Button groups and toolbar buttons, Button states: active, disabled, focus, and hover
Images: Responsive images with .img-fluid, Rounded images, circles, and thumbnails with .rounded, .rounded-circle, .img-thumbnail, Image alignment and utilities
Icons with Bootstrap: Using Bootstrap Icons or integrating Font Awesome, Applying icons to buttons and links, Icon sizes and alignment
Containers: .container vs. .container-fluid, Fixed-width vs. full-width containers, Responsive containers for different screen sizes
Bootstrap Grid System in Detail: Creating multi-column layouts: .col-md-6, .col-lg-4, etc., Offsetting and ordering columns, Grid nesting and offsets for complex layouts
Spacing Utilities: Margins and paddings: .m-3, .mt-5, .px-2, Responsive spacing classes, Controlling spacing between elements with margin/padding utilities
Navigation Bar (Navbar): Creating responsive navigation bars using .navbar, Navbar components: brand, links, forms, and dropdowns, Mobile-friendly navbar using the hamburger menu, Customizing navbar background, colors, and alignments
Cards: Using .card for creating card components, Card body, header, footer, and image, Card groups and card decks for multi-card layouts, Styling cards with custom classes
Alerts: Using .alert for displaying messages, Customizing alert styles: success, warning, danger, info, Dismissing alerts with JavaScript and .alert-dismissible

Modals: Creating modal dialogs with .modal, Modal header, body, footer, and close button, Controlling modal visibility using JavaScript, Using modal for forms, notifications, and more
Forms: Creating forms with .form-control, Input groups for adding icons or buttons to form fields, Custom checkboxes, radio buttons, and selects, Form validation using Bootstrap classes and custom styles
Display and Positioning: Display utilities: .d-block, .d-inline, .d-none, etc., Visibility utilities: .visible, .invisible, Positioning utilities: .position-relative, .position-absolute, .position-fixed
Flexbox Utilities: Flexbox basics: .d-flex, .justify-content-*, .align-items-*, .flex-row, .flex-column, Flexbox utilities for centering and alignment, Flexbox ordering and wrapping
Colors and Backgrounds: Text and background color utilities, Color classes: .text-primary, .bg-success, etc., Background utilities for gradients and images
Sizing and Overflow Utilities: Width and height utilities: .w-50, .h-100, Controlling overflow: .overflow-auto, .overflow-hidden
Borders and Shadows: Border utilities: .border, .border-top, .rounded, .border-light, Box-shadow utilities: .shadow, .shadow-lg
Mobile-First Design Philosophy: Why Bootstrap is mobile-first and how it helps responsive design, Understanding responsive breakpoints (xs, sm, md, lg, xl, xxl)
Creating Responsive Layouts: Building a mobile-first, responsive webpage, Making images, tables, and forms responsive, Handling mobile navigation with collapsible menus
Carousel: Creating image carousels with .carousel, Carousel controls: next/previous buttons and indicators, Customizing carousel items and controls

INTRODUCTION TO NODE JS
INTRODUCTION TO EXPRESS JS

Project 1 – Responsive Landing Page: Build a simple, responsive landing page with navigation, hero section, and call-to-action button
Project 2 – Blog Layout: Create a responsive blog layout with cards, grid system, and a sidebar navigation
Project 3 – E-commerce Product Page: Design a product page with cards, product details, image gallery, and a modal for product options
Project 4 – Dashboard Layout: Create a responsive admin dashboard with navigation, grid-based layout, cards, and data tables

Text Book:
Introduction to frontend technology HTML, CSS and JavaScript Web Publishing language By Laura Lemay, Rafe Colburn, Jennifer kyrnin 1st Edition,2022

Reference Books:
Theory, practical and critical problem solving in frontend technology (HTML5, CSS3, JavaScript and Adv. JavaScript): Dr. T. Vasudev, Dr. Chandrajit M & Prof. Arvind G.

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.

BCA405: Discrete Structures						
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 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 - I : **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 - II : **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. **Trees:** Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multi-graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths.
UNIT - III **Combinatorics:** Introduction, Counting Techniques, Pigeonhole Principle. Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

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.

BCA501: Data Warehousing & Data Mining

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 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 Warehouse:

Definition, Differences between Operational Database Systems and Data Warehouses, OLTP vs. OLAP, 3 Tier Architecture of Data Warehouse, Concept of ETL.

UNIT 2- Data Warehouse Modeling:

Data Cube- A Multidimensional Data Model, Stars, Snowflakes, and Fact Constellations: Schemas for Multidimensional Data Models, OLAP operation.

UNIT 3- Data Mining:

Definition, Data Mining as the Evolution of Information Technology, Knowledge Discovery Process (KDP), Classification of Mining systems, Techniques involved.

UNIT 4- Data Preprocessing:

Needs, Pre-processing data, Data Cleaning, Data integration and transformation, data reduction, discretization, Concept of hierarchy generation.

UNIT 5- Data Mining Techniques:

Introduction to Association Rule and Association Rule Mining, Classification: Decision Tree Induction and Bayesian Classification algorithm, K-nearest neighbor, Clustering: Cluster Analysis.

UNIT 6- Data Mining Trends:

Mining Complex Data Types, Methodologies of Data Mining, Data Mining Applications, Web Mining.

Suggested Reading:

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.

BCA502: MERN Full Stack Development- Backend					
L	**T**	**P**	**Theory**	**Internal**	**Total Marks**
Hours					
3	1	4	70	30	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: DBMS, Manipulate files and installation of software.

Course Objectives:

1. Understand JavaScript fundamentals, including variables, data types, functions, loops, operators, and the Event Loop, to develop basic programming solutions.
2. Apply Advanced JavaScript concepts like arrays, objects, ES6 features, DOM manipulation, asynchronous programming, and API handling using fetch and Axios.
3. Understand the core concepts of Node.js, including its asynchronous, event-driven nature. Learn how to use Nod e.js to build high-performance, non-blocking backend services.
4. Understand the fundamentals of MongoDB, a NoSQL database, and its advantages in modern applications. Learn how to perform basic operations like create, read, update, and delete (CRUD) in MongoDB.
5. Learn Mongoose, an ODM (Object Data Modeling) library that simplifies interaction with MongoDB. Understand how to define schemas, models, and validation for MongoDB documents.

Detailed Syllabus:

Unit-I Introduction to JavaScript, Features, Scopes, Variables- Var, Let and Const, Data Type, Conditional Statements, Operators, Loops, Comments, Function, Anonymous Function, Map, Filter, Reduce, Event Loop.
Unit-II Array, Object, Array and Object destructuring, ES6, Dom Manipulation, Error Handling, Asynchronous JavaScript- Promises, Callbacks, Async Await. Introduction to API – Fetch and AXIOS, JSON – Parse, Stringify
Unit-III Introduction to React, Introduction to NodeJS, what is node.js, Introduction to NPM, Node Process Model, Setup node.js, Debugging node.js app, Modules in NodeJS, understanding exports and require, Creating modules

Unit-IV Express JS, Introduction to Express JS, Installation of Express JS, Creating server using express JS, Web Browser Building, Express Router, Express Listen Methode, Request matching, Route parameter, Handler function, Request object and Response object, get, post, put, delete Methods, Packages and middleware, Body-parser, cors and credential,
Unit-V Introduction to MongoDB, Installing MongoDB, The current SQL/NoSQL landscape, Document oriented vs. other types of storage, MongoDB databases, MongoDB Collections, MongoDB Documents, CRUD Operations in MongoDB, MongoDB Methods- insert(), update(), save(), find(), delete(), Working with equality, Query operators, Building complex queries, Updating documents, Deleting documents
Unit-VI Introduction to Mongoose, installing Mongoose, Connecting to MongoDB from Mongoose, Core concepts of Mongoose, understanding Mongoose schemas and datatypes, Working with Models, Using modifiers in schema, Using virtual fields, and Optimizing query performance by enabling indexes.

Text Book:

1. Introduction to Backend Development Technology “Node.js” Design Patterns" by Mario Casciaro
2. "Express.js Guide: The Comprehensive Book on Express.js" by Azat Mardan
3. "Learning MongoDB" by Jason O'Brien, "Mongoose for Application Development" by Simon Holmes

Reference Books:

1. Theory, practical and critical problem solving in backend technology (Node JS, Express JS, Mongoose and MongoDB): by Mr. David Herron, Mr. Douglas Crockford, Mr. Kristina Chodorow

.

Course Outcomes:

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

1. Students will be able to define the programming principles behind theoretical computer science.
2. Students will be able to identify the different computational problems and their associated complexity.
3. Students will understand how to connect client with server, creating a server and HTTP methods.
4. Students will be able to differentiate and give examples for the different types of backend model , Handle file uploads, interactions with cloud services, and external databases.
5. Learn how to use MongoDB to perform advanced data querying, validation, and population (relationships between documents).
6. Integrate the MERN stack (MongoDB, Express.js, React.js, Node.js) and apply deployment strategies to build and host full-stack applications effectively.

BCA503: Multimedia and its Applications						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	0	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.

BCA514 (DSE1): Artificial Intelligence						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	0	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: - 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, Fraud detection etc. so demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.
4. 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.
5. To evaluate the different stages of development of the AI field from human like behavior to Intelligent Agents.

Detailed Syllabus

UNIT I **Introduction:** Overview of Artificial Intelligence- Problems Of AI, AI Technique. 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 II **Search Techniques:** Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bidirectional Search, Comparing Uniform Search Strategies, Greedy Best-First Search, A* Search, Genetic Algorithms.
UNIT III **Knowledge representation:** Knowledge Representation Issues, Representation and Mapping, Approaches To Knowledge Representation, Issues In Knowledge Representation, Knowledge manipulation, Knowledge acquisition.
UNIT IV **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 V **Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Dempster-Shafer Theory. Introduction of Natural Language Processing
UNIT VI 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.

BCA515 (DSE1): UNIX and Shell Scripting						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	0	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: - DOS Operating System

Course Objectives:

1. To familiarize the students with the Operating System.
2. To demonstrate the process, memory, file and directory management issues under the UNIX
3. Operating system.
4. To introduce UNIX basic commands.
5. To make students how to make simple programs in UNIX and administrative task of UNIX.

Detailed Syllabus

UNIT I (6 Hours) **Introduction to UNIX**: features of UNIX, Shell Vs Kernel, types of shell, System Calls, System calls Vs Library functions, UNIX file System, The Parent-Child Relationship, Orphan, Zombie, UNIX Architecture, UNIX Commands.
UNIT II (10 Hours) The first faltering step(Login), Password, Password Ageing, files related commands, Symbolic links, Listing Files & directories, Hidden files, Shell Meta characters, Masking file permission, Changing file permission(Absolute & Symbolic mode), Sticky bit, Directory related commands, Best calculator.
UNIT III (10 Hours) The UNIX file system, INODE Table, Disk related commands, File related commands, viewing files, Locating files, Taking printouts, File Compression (File Compression & Archiving), Filters, The Stream Editors, I/O redirection & Piping, Command substitution.
UNIT IV (10 Hours) Process basic, process status, Mechanism of process creation, Job Control, background processes, killing a process, Daemon, changing process priorities, Scheduling a process, process synchronization, Semaphores, Communication in UNIX, System Administration in UNIX- the System administrator's login, the administrator's privileges, Adding & Removing groups, user's management, Booting & Shutdown, Making a file system, Mounting & Unmounting File system.

UNIT V (10 Hours) Editor, types of editor (vi and ed), Modes of operation in vi, Navigation in vi (use of h, j, k and lkeys), word navigation (use of b, e and w keys), Scrolling, deleting text, copy & paste in vi, block commands, Searching, Find & replace, Abbreviation(abbr), set command.
UNIT VI (10 Hours) Shell Scripts program, need of shell scripts, Interactive shell scripts, shell variables, shell keywords, System variables, shell keywords, System variables, user defined variables, Command line arguments, exit and status of command, use of operators, Control Instructions in shell.

Text and Reference Books

1. UNIX shell programming by Yashvant Kanetkar ---BPB Publications
2. UNIX Concepts and Application by Sumitabha Das--- Tata McGraw-Hill publication
3. The C Odyssey UNIX the open boundless C By Meeta Gandhi--- BPB Publication

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the structure, features, and file system of the UNIX operating system.
CO2: Execute basic and advanced UNIX commands for file manipulation, process control, and user management.
CO3: Write shell scripts using various shell environments (e.g., Bourne, Bash) to automate system tasks.
CO4: Apply decision-making, looping, and user-defined functions in shell scripting for problem-solving.
CO5: Develop real-time utilities and automate repetitive administrative tasks using shell scripting.

BCA516 (DSE1): PHP						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	0	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 Datatype , 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.

BCA517 (GE3): Graph Theory

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 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. **Trees and Spanning Trees**: Definition and properties of trees, rooted trees, binary trees, tree traversal techniques (infix, prefix, postfix), spanning trees, minimum spanning trees (Prim's & Kruskal's).
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.

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.

BCA518 (GE3): Digital Marketing						
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: 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.

BCA601: Data Science

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 and Data Structures
2. Understanding of Statistics and Mathematics

Course Objectives:

1. To introduce the fundamental concepts, tools, and techniques used in data science.
2. To develop skills in data collection, cleaning, visualization, and exploratory data analysis.
3. To enable students to apply statistical and machine learning techniques for data-driven decision-making.
4. To provide hands-on experience with programming tools such as Python and libraries like Pandas, NumPy, and Matplotlib.

Detailed Syllabus:

Unit I: Introduction to Data Science: Definition and importance of Data Science, Data Science Life Cycle, Applications ofData Science, Roleof a Data Scientist, OverviewofPython, R and SQL, Introduction to Jupyter Notebook and Anaconda, Overview of libraries: NumPy, Pandas, Matplotlib and Scikit learn, Structured vs. Unstructured Data, Data Collection methods, Data Formats and Data Sources.
Unit II: Data Preprocessing: Data Preprocessing: Handling missing data, Data cleaning and transformation, Normalization and standardization, encoding categorical variables, Descriptive statistics (mean, median, mode, variance, standard deviation), Data summarization techniques, Outlier detection.
Unit III: Statistics and Mathematics for Data Science:Bayes' Theorem, Conditional Probability, Probability Distributions (Normal, Binomial, Poisson, Exponential), Central Limit Theorem, Confidence Intervals, Matrix Operations (Dot Product, Transpose, Inverse), Derivatives, Partial Derivatives, Gradient Descent.
Unit IV: Machine Learning Basics: Definition and types, Supervised, Unsupervised, Reinforcement Learning, Applications of Machine Learning, Regression (Linear Regression, Logistic Regression), Classification (Decision Trees, K-Nearest Neighbors, Naïve Bayes), Clustering (K-Means, Hierarchical Clustering), Dimensionality reduction (PCA), Training and testing datasets, Cross-validation, Evaluation metrics: Accuracy, Precision, Recall, F1 Score.

Unit V: Data Visualization and Big Data Technologies:Data Visualization: Importance of Visualization in Data Science, Principles of effective visualization, Visualizationtools:Matplotlib,Seaborn,Typesofcharts:barchart,piechart,linegraph,scatterplot, heatmap, Dashboarding (Tableau, Power BI), HadoopEcosystem, HDFS, MapReduce and YARN.
Unit VI: Advanced Topics and Applications: Basics of Big Data, Tools: Hadoop, Spark, Overview of NoSQL databases, Basics of NLP, Sentiment Analysis, Text preprocessing techniques, Real-world use cases: Healthcare, Finance, E-commerce, social media, Ethical considerations in Data Science, Artificial Intelligence (AI) in Data Science, Deep Learning and Neural Networks basics, Data Engineering vs. Data Science.

Text and Referenced Books:

1. Steven S. Skiena, "The Data Science Design Manual", Springer 2017.
2. Rachel Schutt & O'neil, "Doing Data Science", Straight Talk from The Front line, O'REILLY, ISBN:978-1-449-35865-5, 1st edition, October 2013.
3. Data Science from Scratch: First Principles with Python, Joel Grus, O'Reilly Media
4. Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Müller & Sarah Guido, O'Reilly Media

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts, tools, and techniques used in data science.
CO2: Collect, clean, and preprocess real-world datasets for effective analysis.
CO3: Apply statistical methods and machine learning algorithms to extract meaningful insights from data.
CO4: Visualize data using appropriate tools and libraries such as Matplotlib and Seaborn.
CO5: Develop data-driven solutions using Python and popular data science libraries like Pandas, NumPy, and Scikit-learn.

BCA602: Java Programming						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	0	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.

BCA603: Power BI						
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 Excel and Data Handling
2. Fundamentals of Data Analysis and Visualization

Course Objectives:

1. To introduce the fundamentals of business intelligence and the role of Power BI in data analysis and reporting.
2. To develop skills in importing, transforming, and modeling data using Power BI tools and techniques.
3. To enable students to create interactive dashboards and visualizations for effective data storytelling.
4. To provide hands-on experience with DAX (Data Analysis Expressions) for performing advanced calculations and custom measures.

Detailed Syllabus

UNIT I: **Introduction to Power BI:** Introduction to Power BI, Installation and setup of Power BI Desktop, Need for Power BI, Importance of Power BI, Introduction to Business Intelligence, Traditional BI vs. Power BI, Power BI vs Excel, Uses of Power BI.
UNIT 2: **Power BI Interface Overview**, Importing and Connecting Data (Excel, CSV, databases, and cloud sources). Exploring the Fields, Visualizations, and Filters panes. **Data Transformation**: Basic transformation, Introduction to Power Query, Use the first row as a header, Remove row, Add new columns, Add conditional columns, Remove blank/null values.
UNIT 3: **Data Modeling:** Understanding relationships between tables, Create relationships between multiple tables, Creating calculated columns, measures, and hierarchies. **Data Visualization:** Types of visualizations: Tables, Charts, Maps, Cards, etc, Customizing visuals (filters, slicers,),Formatting and enhancing visual appeal, Creating dashboards with KPIs.Saving & Publishing your report

Text and Reference Books:

1. Mastering Microsoft Power BI, Brett Powell, Packt Publishing
2. Microsoft Power BI Quick Start Guide, Devin Knight, Brian Knight, Mitchell Pearson, Manuel Quintana, Packt Publishing.
3. The Definitive Guide to DAX, Alberto Ferrari & Marco Russo, Microsoft Press
4. Analyzing Data with Power BI and Power Pivot for Excel, Alberto Ferrari & Marco Russo, Microsoft Press

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the core concepts of business intelligence and the functionality of Power BI.
CO2: Import, clean, and transform data from various sources using Power BI tools.
CO3: Create data models and relationships to support efficient data analysis.
CO4: Design interactive dashboards and reports using various visualization techniques.
CO5: Apply DAX functions to perform complex calculations and enhance analytical capabilities.

BCA614 (DSE2): Artificial Neural Networks						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	0	70	30	0	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: - 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.
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.

BCA615 (DSE2): E-Business with Security Issue						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	0	70	30	0	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 Internet and Web Technologies
2. Fundamentals of Information Security

Course Objectives:

1. Define e-commerce and e-Business.
2. Compare e-commerce with traditional commerce.
3. Understand media convergence.
4. Explain the business applications of e-commerce.
5. Discuss the need for e-commerce and e-Business.
6. Describe the basics of e-commerce: network and electronic transaction today.

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 Issuesin 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:, Introductionof 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 the fundamental concepts, models, and infrastructure of e-business.
CO2: Analyze various e-business strategies and technologies used in online commerce.
CO3: Evaluate the role of digital payment systems and e-business applications in different sectors.
CO4: Identify major security threats and challenges in e-business environments.
CO5: Apply basic security measures such as encryption, authentication, and secure protocols to protect e-business transactions.

BCA616 (DSE2): Data &Network Security						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	0	70	30	0	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. 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.

BCA617 (DSE2): Advanced SQL Programming

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
3	1	0	70	30	0	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:

1. Basic Knowledge of SQL and Relational Databases
2. Familiarity with Database Management Systems (DBMS)

Course Objectives:

1. Knowledge of DBMS, both in terms of use and implementation/design.
2. Understand basic database concepts, including the structure and operation of the relational data model. Discussed about the normalizations.
3. Learn structured query language (SQL) to an intermediate/advanced level.
4. Understand the structure and design of relational databases and using different quarries
5. Be able to write PL/SQL statements that create database objects.

Detailed Syllabus

Unit-1 Database Concept: Database and Data Base Management System Definition, File Management System and its disadvantages, Benefits of DBMS, RDBMS Definition, DBMS V/S RDBMS.
Unit-2 Relational Databases: E.F Codd's Rules, Normalization: 1NF, 2NF, 3NF, BCNF. Relational Databases Terminology: Relation, Tuple, Attribute, Cardinality, Degree, Domain.
Unit-3 Keys:Super Key, Candidate Key, Primary Key, Foreign Key. Structured Query Language: Features of SQL, SQL *PLUS, SQL V/s SQL *PLUS, Rules for SQL, SQL Delimiters, Components of SQL. Constraints: Data constraints, Types of data constraints: UNIQUE, NOT NULL at column level, CHECK, NULL value constraint
Unit-4 Relational Databases: Relational Algebra. Operations, Select, Project, Union, Difference, Intersection Cartesian product, Join, Natural Join, Simple Queries, Nested Queries, Join queries, semi-join queries, self-join.
Unit-5 **PL/SQL:** Basic Introduction, Advantages of PL/SQL, The generic PL/SQL block, Literals, Variables, Constants, Comparisons, Comments. **Control Structure:** Conditional Control, Iterative Control and Sequential Control.
Unit-6 **PL/SQL Transaction:** Cursor, Types of Cursor: Implicit cursor, Explicit cursor. **PL/SQL Database objects:** Introduction of Procedure and Functions, Advantages of using Procedure and Functions, Database Triggers, Triggers v/s Procedure, Types of Triggers

Text and Reference Books

1. Database System Concepts, Henry Korth, A. Silberschatz, 5th Edition, 2005.
2. SQL, PL/SQL the Programming Language of Oracle, Ivan Bayross, BPB Publications, 4th Edition.
3. 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 and apply advanced SQL concepts such as subqueries, joins, and set operations.
CO2: Develop and use stored procedures, functions, and triggers to enhance database functionality.
CO3: Implement transaction control and error handling mechanisms in SQL programming.
CO4: Optimize queries and use indexing techniques for improving database performance.
CO5: Design, implement, and manage complex database applications using advanced SQL features.