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DEEMED TO BE
UNIVERSITY
— **ONLINE** —
NAVI MUMBAI

**Scheme and Syllabus
for
Bachelors of Computer Applications
(BCA)**

*With effect from
Academic Year 2025-26*

Program Structure for Bachelor of Computer Applications

D. Y. Patil Deemed to be University, Navi Mumbai

Semester	Course Type	Subject Name	New Credits	Total
1	Major Mandatory	C Programming	3	21
1	Major Mandatory	Fundamentals of Computer System	3	
1	Open Elective-I	Media and Entertainment-I	3	
1	Open Elective-II	Principles of Marketing	3	
1	Vocational Skill	Office Automation-I	3	
1	Ability Enhancement	English I	2	
1	Value Education	Constitution of India	2	
1	Indian Knowledge System	Indian Contribution to Computational Science	2	
2	Major Mandatory	Data Structures	3	22
2	Major Mandatory	Computer Organization and Architecture	3	
2	Multidisciplinary Minor	Mathematics for Computer Applications	3	
2	Open Elective-III	Media and Entertainment-II	3	
2	Open Elective-IV	Entrepreneurship Development	3	
2	Vocational Skill Course	Data Analysis using MS-Excel	3	
2	Ability Enhancement Course	English II	2	
2	Value Education Course	Environmental Studies	2	
3	Major Mandatory	Database System Management	3	20
3	Major Mandatory	Object Oriented Programming - Java	3	
3	Multidisciplinary Minor	Elements of Statistics	3	
3	Multidisciplinary Minor	Discrete Mathematics	3	
3	Open Elective-V	Enterprise Resource Planning	3	
3	Vocational Skill Course	Computer Hardware and Assembly	2	
3	Ability Enhancement Course	Business Communication	3	
4	Major Mandatory	Computer Networks	3	20
4	Major Mandatory	Operating System	3	
4	Multidisciplinary Minor	Microprocessors and Microcontrollers	3	
4	Multidisciplinary Minor	Theory of Automata	3	
4	Open Elective-VI	Project Management	3	
4	Skill Enhancement Course	Python Programming	3	
4	Ability Enhancement Course	Impression Management	2	
5	Major Mandatory	Software Engineering	4	20
5	Major Mandatory	Design and Analysis of Algorithm	4	
5	Multidisciplinary Minor	Ecommerce	3	
5	Multidisciplinary Minor	Multimedia Applications	3	
5	Major Elective	Cloud Computing	3	
5	Vocational Skill Course	Digital Marketing	3	
6	Major Mandatory	Artificial Intelligence	4	20
6	Major Mandatory	Machine Learning	4	
6	Multidisciplinary Minor	Internet of Things	3	



6	Multidisciplinary Minor	Image Processing	2	
6	Major Elective	Big Data Analytics	3	
6	Project Work	Project Work	4	
				123



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Semester I

Syllabus

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S1-1	C Programming	3	-	-	3	3

Course Objectives:

1. To introduce the foundations of computing, programming and problem- solving using computers.
2. To develop the ability to analyse a problem and devise an algorithm to solve it.
3. To develop the basic concepts and terminology of programming in general.
4. To test, debug and execute programs.

Course Outcomes:

On successful completion of course, learner/student will be able to:

1. Read, understand and trace the execution of programs written in C language.
2. Develop modular programs using control structures.
3. Understand Function and parameter passing in functions.
4. Write programs that perform operations on arrays.
5. To understand String and its Types.
6. To understand pointers in the C.

Module No	Contents	Hrs. (45)	CO
1.	Problem solving and ‘C’ programming 1.1 Problem solving using Computers 1.2 Programming Languages as tools, types of languages 1.3 Algorithms-definition, characteristics, examples, advantages and limitations 1.4 Flowcharts - definition, notations, examples, advantages and limitations, Comparison with algorithms 1.5 Structure and example of first ‘C’ program 1.6 Compilation process (compilers, interpreters) 1.7 Character set, Keywords, Identifiers, 1.8 Variables, Constants (character, integer, float, string, escape sequences, enumeration constant)	07	CO1



	1.9 Data Types (Built-in and user defined data types) 1.10 Operators, Expressions, Types of operators 1.11 Arithmetic operators, Increment Decrement operators, Relational and logical operators, Bitwise operators, Assignment operators, Comma operator, sizeof operator, conditional operator, Operator precedence and Order of evaluation 1.12 Formatted input and output, format specifiers		
2.	Control Structures 2.1 Decision making structures:- if ,if-else, else-if ladder, switch 2.2 Loop control structures - while ,do while, for 2.3 Use of break and continue 2.4 Nested control structures 2.5 Unconditional branching (goto statement)	07	CO2
3.	Functions 3.1 Function definition, Types of functions (Standard library and User defined functions) 3.2 Function parameters/arguments (Actual, Formal) 3.3 Parameter passing method (by value), return statement 3.4 Recursive functions 3.5 Scope of variables and Storage classes	07	CO3
4.	Arrays 4.1 Concept of array, advantages, disadvantages 4.2 Types of Arrays – One, Two dimensional array 4.3 Array Operations - declaration, initialization, accessing array elements 4.4 Memory representation of two-dimensional array (row major and column major) 4.5 Passing arrays to function 4.6 Array applications - Linear search, sorting an array (bubble sort)	08	CO4
5.	Strings: 5.1 Declaring & Initializing string variables; 5.2 String handling functions - strlen, strcmp, strcpy and strcat; 5.3 Character handling functions - toascii, toupper, tolower, isalpha, isnumeric etc.	08	CO5
6.	Pointers in C: 6.1 Understanding pointers - Declaring and initializing pointers, 6.2 accessing address and value of variables using pointers; 6.3 Pointers and Arrays; Pointer Arithmetic; 6.4 Advantages and disadvantages of using pointers;	08	CO6



Text Books:

1. C: The Complete Reference, By Herbert Schildt.
2. C Programming Language, By Brain W. Kernighan
3. Kernighan & Ritchie: The C Programming Language (PHI)

Reference Books:

1. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India
2. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill
3. Programming in ANSI C, Ram Kumar and Rakesh Agrawal
4. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI.



Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S1-2	Fundamentals of Computer System	3	-	-	3	3

Course Objectives:

1. Identify and describe the components of a computer system, including hardware, software, and networking essentials.
2. Demonstrate proficiency in binary arithmetic, character encoding, and basic algorithm design principles.
3. Analyze computer organization principles, including CPU architecture, memory hierarchy, and input-output mechanisms.
4. Understand and utilize operating system functions such as process management, memory management, and file systems.
5. Implement basic database concepts and SQL commands for data manipulation and database design.
6. Develop foundational programming skills and understand software development principles and lifecycle stages.

Course Outcomes:

On successful completion of course, learner/student will be able to:

1. Comprehend the fundamental components of a computer system, including hardware components, software categories, and basic networking concepts.
2. Proficiency in binary arithmetic, character encoding, data types, and basic algorithm design using flowcharts.
3. Insights into computer organization, microprocessor functioning, assembly language basics, and input-output mechanisms.
4. Understand functions of operating systems, process and memory management, file systems, and shell scripting basics.
5. Introduction to database concepts, SQL commands, software development life cycle (SDLC), programming fundamentals, and object-oriented programming principles.
6. Understanding of web development technologies such as HTML, CSS, JavaScript, and the ability to create simple web pages and scripts.



Module No	Contents	Hrs. (30)	CO
1.	Introduction to Computers: Introduction to Computer Science and Information Technology-Evolution of Computers, Importance and Applications of Computers. Basic Computer Hardware Overview-Components of a Computer System, Input, Processing, Output, and Storage Devices. Understanding Software-System Software vs. Application Software, Operating Systems and Utility Programs. Computer Networks and Internet Basics-Overview of Computer Networks, Internet Services and Protocols	5	CO1
2.	Understanding Data Representation: Number Systems and Binary Representation-Decimal, Binary, Octal, and Hexadecimal Number Systems, Binary Arithmetic. Character Encoding and ASCII-ASCII and Unicode Standards, Encoding and Decoding Characters. Data Types and Data Structures-Primitive Data Types, Arrays, Lists, Stacks, and Queues. Introduction to Algorithms and Flowcharts-Basics of Algorithms, Flowchart Symbols and Examples	5	CO2
3.	Computer Architecture and Organization: Basics of Computer Organization-CPU Architecture: Registers, ALU, Control Unit, Memory Hierarchy: Cache, RAM, ROM. Input-Output Organization - I/O Devices and Interfaces, Interrupts and DMA. Assembly Language Basics-Introduction to Assembly Language, Assembly Language Instructions and Programming. Introduction to Microprocessors-Evolution of Microprocessors Popular Microprocessor Architectures (e.g., Intel x86)	5	CO3
4.	Operating Systems Fundamentals: Overview of Operating Systems - Functions of an Operating System -Types of Operating Systems: Batch, Multi-programmed, Time-sharing, Real-time. Operating System Components-Kernel, Shell, File System, System Calls and API Session. Process Management-Process States and Control, CPU Scheduling Algorithms. Memory Management and Virtual Memory, Memory Allocation Techniques, Paging and Segmentation.	5	CO4
5.	File Systems and Disk Management: File Systems and File Operations - File Attributes and Operations - File System Structures: FAT, NTFS, ext4. Disk Management and RAID-Disk Partitioning and Formatting, RAID Levels and Data Redundancy. Introduction to Shell Scripting-Basics of Shell Scripting, Writing Simple Shell Scripts. Introduction to Database	5	CO5



	Systems-Relational vs. Non-relational Databases-SQL Basics: DDL, DML, DQL, DCL commands		
6.	Introduction to Software Development : Software Development Life Cycle (SDLC) Programming Fundamentals-Basics of Programming Languages: Syntax, Variables, Data Types, Control Structures: Conditional Statements and Loop. Introduction to Object-Oriented Programming (OOP)-OOP Concepts: Classes, Objects, Inheritance, Polymorphism, Encapsulation. Basics of Web Development-Introduction to HTML, CSS, and JavaScript, Creating Simple Web Pages and Scripts	5	CO6

Text Books:

1. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication
2. David Riley and Kenny Hunt, Computational thinking for modern solver, Chapman & Hall/CRC,

Reference:

1. J. Glenn Brook shear,” Computer Science: An Overview”, Addison-Wesley, Twelfth Edition,
2. R.G. Dromey, “How to solve it by Computer”, PHI,

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S1-3	Media & Entertainment-I	3	-	-	3	3

Course Objectives:

1. To trace the historical development of Indian media from traditional forms to modern mass media.
2. To explore the structure, functioning, and global impact of Bollywood as a significant component of Indian cinema.
3. To analyze the contributions and significance of regional cinema industries in India.
4. To examine the growth and impact of television broadcasting in India.
5. To analyze the emergence and impact of Over-the-Top (OTT) platforms in India.
6. To understand the regulatory frameworks governing the Indian media and entertainment industry and explore future trends.

Course Outcomes:

On successful completion of course, learner/student will be able to:

1. Understand the evolution of Indian media and its impact on society and culture
2. Gain insights into the cultural, economic, and artistic dimensions of Bollywood through case studies and discussions.
3. Understand the cultural diversity and narrative richness offered by regional cinema through case studies and discussions.
4. Appreciate the dynamics of content creation, distribution, and consumption in the Indian television sector.
5. Recognize the disruptive influence of OTT platforms on traditional media and entertainment sectors.
6. Evaluate the regulatory challenges and emerging trends shaping the future of the Indian media landscape.

Module No	Contents	Hrs. (30)	CO
1.	Evolution of Indian Media - Historical overview: From traditional forms like folk theatre and street performances to modern mass media. - Evolution of Indian cinema: Silent era, golden age, and contemporary trends in Bollywood and regional cinema.	5	CO1



	- Growth of television broadcasting: From Doordarshan to satellite channels and streaming services. - Rise of digital media: Impact of internet penetration on media consumption habits and content creation.		
2.	Bollywood: Heart of Indian Cinema - Bollywood origins and growth. - Contributions of Bollywood to Indian culture and economy. - Film financing and distribution models in Bollywood. - Impact of globalization on Bollywood's reach and collaborations. - Content trends and technological advancements in Bollywood filmmaking.	5	CO2
3.	Regional Cinema: Diverse Narratives - Contributions of South Indian, Bengali, Marathi, and other regional film industries. - Unique storytelling styles and thematic elements in regional cinema. - Challenges and opportunities faced by regional filmmakers. - International recognition and impact of regional cinema. - Technological advancements and innovations in regional filmmaking.	5	CO3
4.	Television Broadcasting: Changing Dynamics - Evolution of television broadcasting in India. - Television genres and programming trends. - Role of television in shaping public opinion and culture. - Regulatory frameworks and challenges faced by the television industry. - Technological advancements and the emergence of digital television platforms.	5	CO4
5.	Rise of OTT Platforms: Digital Revolution - Rise of OTT platforms and their business models. - Original content production and investments by OTT platforms. - Changing viewing habits and audience preferences. - Regulatory challenges and content censorship on OTT platforms. - Competition and collaboration between OTT platforms and traditional media.	5	CO5
6.	Media Regulation and Future Trends - Regulatory bodies and frameworks governing the Indian media industry. - Challenges related to content regulation, censorship, and ethical standards. - Emerging trends such as augmented reality, virtual reality, and artificial intelligence in media. - Impact of globalization and digitalization on the Indian media landscape. - Future prospects and challenges for the Indian media and entertainment industry.	5	CO6



Text Books:

1. Ranganathan, M. and Rodrigues, U.M., 2010. *Indian media in a globalised world*. Sage.
2. Lotz, A.D., 2014. *The television will be revolutionized*. NYU Press.
3. Downey, E. ed., 2012. *Public Service, Governance and Web 2.0 Technologies: Future Trends in Social Media: Future Trends in Social Media*. IGI Global

Reference Books:

1. Turner, G. and Tay, J. eds., 2009. *Television studies after TV: Understanding television in the post-broadcast era*. Routledge.
2. Finkelstein, R., Ricketson, M., Tiffen, R., Papandrea, F., Walker, K., Young, C. and Hill, G., 2012. *Report of the independent inquiry into the media and media regulation*. Department of Broadband, Communications and the Digital Economy.
3. Landau, N., 2015. *TV outside the box: trailblazing in the digital television revolution*. Routledge.

Online Resources:

1. TRAI (Telecom Regulatory Authority of India)
<https://www.trai.gov.in/>
2. BARC India (Broadcast Audience Research Council)
<https://www.barcindia.co.in/>

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S1-4	Principle of Marketing	3	-	-	3	3

Course Objectives:

1. To develop marketing field
2. To Effective distribution of products
3. To find sources for further information market problems
4. To take appropriate actions in the course of actions

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Student will be able to understand how the manufacturers in selecting the correct channel of distribution for their products.
2. Student will be able to understand how the marketer know the tastes and preferences of the customers and accordingly make the product.
3. It helps the student in the matter of selection of the right promotional tool.
4. Student will be able to understand how profit can be maximized
5. Student will be able to understand how marketing starts and ends with the buyer.
6. Student will be able to understand how marketing precedes and succeeds production

Module No	Contents	Hrs. (30)	CO
1.	Introduction to Marketing: Market – Introduction – Meaning of Market, Definition of Market, Classification of Markets , Marketing – Features of Marketing, Objectives of Marketing, Importance of Marketing, Marketing Functions, Approaches to the study of Marketing, Modern Marketing Concept.	6	CO1
2.	Marketing Mix and Process: Marketing Mix – Meaning, Definition, Elements, Problems, Marketing System – Meaning, Marketing Process, Concentration, Dispersion, Equalization , Product Planning and Development – Product Life Cycle (PLC) – New Product development strategy.	6	CO2
3.	Target Marketing: Market segmentation - Concept, Significance and basis, Concept of Market positioning.	4	CO3
4.	Pricing: Pricing Policy – Factors influencing pricing – Methods of Pricing – Determination of Price.	4	CO4



5.	Sales Promotion: Promotional Strategy, Sales Promotion, Personal Selling & Advertisement, Channels of Distribution, Influencing factors – Importance, Types, Functions.	5	CO5
6.	Modern Marketing: Modern Marketing Trends – E-Marketing – TeleMarketing – M-Marketing.	5	CO6

Text Books:

1. Principles of Marketing by Philip Kotler.
2. Marketing Management by Rajan Nair.

Reference Books:

1. Modern Marketing Principles and Practice by R.S.N. Pillai and Bhagavathi.
2. Marketing by Jayasankar.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S1-5	Office Automation-I	3	-	-	3	3

Course Objectives:

1. Utilize file managers, word processors, spreadsheets, and presentation software proficiently.
2. Describe features and functions of different categories of application software.
3. Present conclusions effectively both orally and in writing.
4. Understand dynamics of office environment.
5. Demonstrate application software proficiency in office settings.
6. Manage office data tasks efficiently using Google Suite.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Use file managers, word processors, spreadsheets, presentation software's
2. Describe the features and functions of the categories of application software.
3. Present conclusions effectively, orally and in writing.
4. Understand the dynamics of an office environment.
5. Demonstrate the ability to apply application software in an office environment.
6. Use Google Suite for office data management tasks.

Module No	Contents	Hrs. (30)	CO
1.	Fundamentals of Computers:- Introduction –Computer, Evolution of Computers, Classification of Computers, Applications of Computers, Advantages and Disadvantages of Computers, Similarities Difference between computer and Human, A Computer System, Components of a Computer System.	3	CO1
2.	MS Office:- What's happening with the world of work, Getting started office 365, administering an office 365 Account, What your team can do with office, creating your team Site with Share Point online, Posting, Sharing, and Managing File, Adding and Managing work flows.	4	CO2
3.	Designing & Publishing Using PageMaker, Application of Photoshop:- Introduction, New Features in PageMaker 7.0, Starting Page maker, Understanding PageMaker Tools, Pointer Tool, Text Tool, Rotate Tool, Crop Tool, Oblique line tool, box tool, rectangle frame, Circle	6	CO3



	tool, Circular Frame, Polygon tool, Polygon Frame, Hand tool, File Menu, Layout Menu.		
4.	Operating Computer using GUI based OS:- What is Graphical User Interface, Evolution of Human and Machine Interaction, Common Graphical User Interfaces, Functionality of Graphical User Interface, GUI design consideration: psychological factors, GUI design consideration: standards, GUI Examples, Summary, Solutions/Answers, Further Readings.	6	CO4
5.	Internet and HTML: - Hyper Text Markup Language, Web Application Architecture, Browser Environment in different, Hyper Text Markup Language, Html tags, Example of Html- start with raw content text, Annotate with tags, Browser doesn't care but Programmers do, Example html-Browser output.	5	CO5
6.	Making Small Presentation: - Introduction, Objectives, Basics of PowerPoint, Understanding the screen elements, File lob, Quick Access toolbar, Scroll bar, work area, status bar, Slides pane, Notes pane, Using PowerPoint, Presentations, Slides, Handouts, Opening PowerPoint.	6	CO6

Text Books:

- Microsoft Office 2010 For Dummies By Wallace Wang
- 2007 Microsoft Office System Plain & Simple by Jerry Joyce Microsoft Press
- Office XP : The Complete Reference- Stephen L. Selson – Tata McGraw Hill Education.
- Working in Microsoft Office – Richard Mansfield – Tata McGraw Hill Education.

Reference Books:

- <http://office.microsoft.com/en-us/training/CR010047968.aspx>
- <https://gsuite.google.com/learning-center>
- <http://spoken-tutorial.org>



Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S1-6	AEC: English-1	2	-	-	2	2

Course Objectives:

1. Develop a solid understanding of English grammar, vocabulary, and syntax.
2. Enhance listening and speaking skills for effective communication in various contexts.
3. Improve reading comprehension and writing proficiency for academic and professional purposes.
4. Learn the principles and techniques of formal written communication.
5. Master the art of summarizing to extract key information from texts effectively.
6. Understand the ethical considerations and best practices for using social media responsibly.

Course Outcomes: On successful completion of course, learner/student will be able to

1. Students will demonstrate proficiency in using tenses, subject-verb agreement, and vocabulary in written and spoken communication.
2. Students will identify barriers to effective listening and employ strategies to overcome them.
3. Students will demonstrate improved reading comprehension skills through various texts and genres.
4. Students will produce formal written documents adhering to standard conventions and principles.
5. Students will effectively summarize and convey key information from complex texts.
6. Students will exhibit responsible and ethical behavior in their use of social media platforms.

Module No	Contents	Hrs. (30)	CO
1.	Grammar and Vocabulary • Understanding tenses: Present, Past, Future • Subject-Verb Agreement • Antonyms, Synonyms, Homonyms • Advanced Vocabulary Building Techniques	4	CO1
2.	Listening and Speaking • Types of Listening • Barriers to Effective Listening • Process of Listening and Understanding • Starting Conversations with Small Talk	6	CO2



	• Making Formal Speeches		
3.	Reading and Writing Skills • Comprehension Skills: Skimming, Scanning, Close Reading • Reading Technique: SQ3R • Writing Techniques: Prewriting, Drafting, Revising, Editing, Publishing • Sentence Structure and Paragraph Formation • Grammar in Writing: Punctuation, Sentence Variety	6	CO3
4.	Formal Written Communication • Importance of Formal Written Communication in Professional Settings • Principles of Formal Writing: Clarity, Conciseness, Coherence, Correctness • E- Mail Writing	4	CO4
5.	The Art of Summarizing • Summarizing Techniques: Identifying Main Ideas, Paraphrasing, Condensing Information • Summarizing Different Types of Texts • Importance of Summarizing in Academic and Professional Settings	5	CO5
6.	Ethical Use of Social Media • Understanding Digital Citizenship • Responsible Posting and Sharing • Dealing with Cyberbullying and Online Harassment • Privacy and Security Concerns in Social Media Usage	5	CO6

Text Books:

Communication Skills by Meenakshi Raman and Sangeeta Shrama , Oxford Publication

Reference Books:

1. "English Grammar in Use" by Raymond Murphy
2. "Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo
3. "The Norton Field Guide to Writing" by Richard Bullock, Maureen Daly Goggin, and Francine Weinberg
4. "HBR Guide to Better Business Writing" by Bryan A. Garner
5. "Digital Minimalism: Choosing a Focused Life in a Noisy World" by Cal Newport

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S1-7	Constitution of India	2	-	-	2	2

Course Objectives:

1. Understand historical context: Explore events leading to the Constitution's adoption.
2. Analyze constitutional provisions: Examine fundamental rights, directive principles, and governance structure.
3. Study institutional roles: Explore functions of judiciary, Election Commission, etc.
4. Evaluate amendment process: Critically assess landmark amendments' impact.
5. Assess contemporary issues: Analyze federalism, secularism, and social justice within constitutional framework.
6. Develop critical skills: Foster independent research and analytical thinking.

Course Outcomes: On successful completion of course, learner/student will be able to

1. Historical Context: Grasp influences on Constitution's drafting.
2. Constitutional Analysis: Understand key provisions' significance.
3. Institutional Understanding: Comprehend roles of constitutional bodies.
4. Amendment Process Evaluation: Critically assess amendment impact.
5. Contemporary Issues Assessment: Evaluate constitutional provisions' effectiveness.
6. Critical Thinking and Research Skills: Develop independent research and analytical abilities.

Module No	Contents	Hrs. (30)	CO
1.	Introduction to the Constitution of India • Overview of the historical background leading to the framing of the Indian Constitution • Objectives Resolution and Constituent Assembly Debates • Key features of the Constitution: Preamble, Parts, and Schedules • Evolution of the Constitution through amendments	6	CO1
2.	Fundamental Rights and Directive Principles of State Policy • Fundamental Rights: Concept, significance, and types	5	CO2

	• Directive Principles of State Policy: Meaning and significance • Judicial review and enforcement mechanisms for Fundamental Rights • Balancing Fundamental Rights with Directive Principles		
3.	Structure of Government • Union Government: President, Prime Minister, Council of Ministers, and Parliament • State Government: Governor, Chief Minister, Council of Ministers, and State Legislature • Division of powers between Union and States: Legislative, Executive, and Financial	3	CO3
4.	Constitutional Institutions and Their Functions • Judiciary: Structure and powers of the Supreme Court and High Courts • Election Commission: Role in conducting free and fair elections • Comptroller and Auditor General (CAG): Role in ensuring financial accountability • Attorney General and Advocate General: Roles and responsibilities	3	CO4
5.	Constitutional Amendments and Judicial Activism • Process of amending the Constitution: Article 368 • Landmark amendments and their significance • Judicial Activism: Role of the Judiciary in interpreting and expanding constitutional principles • Important judicial pronouncements shaping Indian constitutional law	7	CO5
6.	Contemporary Issues and Challenges • Federalism: Challenges and debates regarding center-state relations • Secularism and minority rights • Social justice and affirmative action: Reservation policies • Constitutional reforms and the need for evolving interpretations in a changing society	6	CO6

Reference Books:

- "Indian Polity" by M. Laxmikanth
- "Introduction to the Constitution of India" by D. D. Basu
- "Our Constitution: An Introduction to India's Constitution and Constitutional Law" by Subhash C. Kashyap

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S1-8	Indian Contribution to Computational Science	2	-	-	2	2

Course Objectives:

1. To understand the historical context of Indian contributions to mathematics and computational science.
2. To explore the work of Indian mathematicians and scientists in areas such as number theory, algorithms, and computer science.
3. To examine the role of Indian institutions and research organizations in advancing computational science.
4. To analyze the impact of Indian contributions on modern computational methods and technologies.

Course Outcomes:

1. Identify key Indian mathematicians and their contributions to computational science.
2. Analyze the influence of Indian mathematical concepts and algorithms on modern computing.
3. Evaluate the impact of Indian research institutions on global computational science.
4. Synthesize historical and contemporary perspectives on Indian contributions to computational science in a scholarly manner.
5. To assess the role of Indian institutions and research organizations in advancing computational science
6. To analyse current trends and potential future developments in the field wrt Indian contributions to computational science

Module No	Contents	Hrs. (30)	CO
1.	Introduction to Indian Mathematics and Computing Overview of ancient Indian mathematical concepts and methods. Introduction to early Indian contributions to astronomy, geometry, and algebra.	05	CO1
2.	Indian Mathematicians and Their Contributions Study of the works of mathematicians like Aryabhata, Brahmagupta, and Bhaskara. Exploration of contributions to number theory, trigonometry, and calculus.	05	CO2

3.	Indian Contributions to Algorithms and Computation Analysis of Indian algorithms and computational methods. Study of ancient Indian texts on algorithms and their relevance to modern computing.	04	CO3
4.	Modern Indian Computational Science Overview of modern developments in Indian computational science. Case studies of Indian researchers and their contributions to fields like data science, artificial intelligence, and supercomputing.	06	CO4
5.	Indian Institutions and Research Organizations Examination of key Indian institutions involved in computational science. Discussion of collaborative research initiatives and partnerships with international institutions.	05	CO5
6.	Impact of Indian Contributions on Global Science Analysis of the influence of Indian mathematical and computational concepts on global science. Discussion of future trends and potential contributions of Indian researchers to computational science.	05	CO6

Text Books:

1. "The Crest of the Peacock: Non-European Roots of Mathematics" by George Gheverghese Joseph
2. "The Mathematics of India" by David Pingree
3. Computational Techniques in Transient and Turbulent Flow" by B. K. Maheshwari
4. Computational Methods for Electromagnetics and Microwaves" by Ramesh Garg

Reference Books:

Indian Mathematics: Engaging with the World from Ancient to Modern Times" edited by George Gheverghese Joseph



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Semester II

Syllabus

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S2-9	Data Structures	3	-	-	3	3

Course Objectives:

1. Define key terms and concepts related to data structures.
2. Explain the underlying principles behind various data structures and their operations.
3. Analyze the time and space complexity of various data structures.
4. Describe the fundamental sorting and Searching algorithms.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Understand the basic concepts of data structures.
2. Design and implement stacks and Queue and their operations and applications.
3. Design and implement linked list operations (insertion, deletion, traversal) and analyze their time and space complexities.
4. implement binary trees, along with traversal techniques (inorder, preorder, postorder), and apply them in various applications such as binary search.
5. Create graph data structures using adjacency lists or matrices and develop algorithms for graph traversal (DFS, BFS).
6. Acquire knowledge of sorting and searching algorithms and their complexities.

Module No	Contents	Hrs. (45)	CO
1.	Introduction to Data Structures Definition and concept of data structures, Classification of data structures (linear, non-linear), Big O notation for time and space complexity analysis, Basic operations on data structures (search, insertion, deletion), Abstract Data Types (ADTs)	5	CO1
2.	Stacks and Queue Stack: LIFO (Last In First Out) principle, Operations on stacks (push, pop, peek), Applications of stacks (function call handling, expression evaluation), Queue: FIFO (First In First Out) principle, Operations on queues	9	CO2

	(enqueue, dequeue, peek), Applications of queues (job scheduling, message passing)		
3.	Linked List Introduction to linked lists (singly, doubly, circular), Nodes and their structure (data, next pointer), Operations on linked lists (traversal, searching, insertion, deletion), Advantages and disadvantages of linked lists compared to arrays.	8	CO3
4.	Trees Introduction to Trees, Tree terminology (root, node, leaf, parent, child, sibling), Tree traversals (inorder, preorder, postorder), Binary Search Trees (BSTs): searching, insertion, deletion, Applications of trees.	7	CO4
5.	Graph Introduction to graphs (directed, undirected, weighted), Graph representation (adjacency matrix, adjacency list), Graph traversals (depth-first search, breadth-first search)	7	CO5
6.	Sorting and Searching Overview of sorting algorithms (bubble sort, selection sort, insertion sort, merge sort, quick sort), Overview of searching algorithms (linear search, binary search), Analysis of time and space complexity for sorting and searching algorithms	9	CO6

Text Books:

1. Data Structures Using C" by Aaron M. Tenenbaum, Moshe J. Augenstein, and Yedidyah Langsam.
2. Data structures using C by Reema Thareja Oxford
3. Data Structures Through C in Depth" by S.K. Srivastava and Deepali Srivastava

Reference Books:

1. Data Structures Through C" by Yashavant Kanetkar
2. Data Structures and Program Design in C" by Robert L. Kruse, Alexander J. Ryba, and Bruce P. Leung
3. Data Structures and Algorithm Analysis in C" by Clifford A. Shaffer

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S2-10	Computer Organization and Architecture	3	-	-	3	3

Course Objectives:

The student would be able to:

1. Understand functional elements of a computer.
2. Different number representations and data computations.
3. Understand Concept of memory organization
4. Understand multiprocessor system and their working

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Conceptualize the basics of organizational and architecture of a digital computer.
2. Manipulate representation of numbers stored in digital computer.
3. Understand the fundamentals of instruction set and their impact on processor design.
4. Analyze performance issues in processor and memory design of a digital computer.
5. Understanding the different ways of communicating with I/O devices and standard I/O interfaces
6. Demonstrate processing unit with parallel processing.

Module No	Contents	Hrs. (30)	CO
1.	Basic Computer Organization And Design : Computer Organization and Functional Units, Main Memory, CPU operational concepts, Interrupt concept, I/O techniques, BUS concept, System Software, Computer performance factor, system performance Measurement, Architecture and Organization.	5	CO1
2.	Data Representation and Arithmetic Algorithms: Number representations, Fixed point numbers, ALU Design, Datapath organization	4	CO2
3.	CPU Architecture and Instruction Set Principles: Control Unit Organization, ISA categories, Basic concepts of instructions, Hardware software interface, CISC v/s RISC, Addressing modes.	6	CO3
4.	Memory Organization: Computer memory system overview, The Memory Hierarchy, Static and dynamic memory, ROM, Cache memories, performance considerations.	5	CO4



5.	I/O Organization: Introduction, Accessing I/O devices, Interrupt handling, DMA, Buses, Interface circuits, standard I/O interface.	5	CO5
6.	Multiprocessor System: Introduction, classification, symmetric multi-processor, interconnection structure.	5	CO6

Text Books:

1. Govindarajalu, B. Comp Arch And Org, 2E. Tata McGraw-Hill Education, 2010.
2. Stallings, William. Computer organization and architecture: designing for performance. Pearson Education India, 2003.
3. Dr. M. Usha, T.S. Srikanth, Computer System Architecture and Organization, Wiley, 2013.

Reference Books:

1. Hamacher, V. Carl, Zvonko G. Vranesic, Safwat G. Zaky, Zvonko Vransic, and Safwat Zakay. Computer organization. McGraw-Hill, 1996.
2. Michael J. Flynn, Computer Architecture: Pipelined and Parallel Processor Design, Narosa

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S2-11	Mathematics for Computer Applications	3	-	-	3	3

Course Objectives:

1. To develop the basic Mathematical skills of computer science students that are imperative for effective understanding of related subjects.
2. The topics introduced in linear algebra will serve as basic tools for specialized studies in many fields of engineering and technology.
3. To introduce the foundations of algebra for data sciences and applications
4. To understand the basics of combinatorics.

Course Outcomes:

On successful completion of course, learner/student will be able to

CO1: Demonstrate the knowledge of matrices for applications.

CO2: Apply the concepts for solving the system of linear equations.

CO3: Demonstrate the concepts in algebra for further applications.

CO4: Apply the concepts of vector spaces in data sciences.

CO5: Apply the concepts of eigen value and eigen vectors in PCA and dimensionality reductions.

CO6: Use the concepts of combinatorics in real life problems.

Module No	Contents	Hrs. (30)	CO
1.	Rank of Matrices: Definition of matrix, types of matrices, elementary transformations, Inverse of matrix, rank of matrix, echelon form of matrix, and normal form of matrix, relation between PAQ and normal form of matrix	5	CO1
2.	System of Linear Equations: Homogeneous and Non-homogeneous systems, solution of systems, Types of solutions (No Solution, Unique solution and infinitely many solutions:	5	CO2
3.	Algebraic structures: Introduction, binary operation, properties of binary operation, Semigroups, monoids, Groups, Abelian Group, Subgroups, Rings, Zero divisors of ring, Fields, Integral domains	6	CO3
4.	Vector Spaces: Linear Dependence, Linearly Dependent Vectors and Linearly Independent Vectors, Vector Spaces, Subspaces	5	CO4
5.	Eigen Values and Eigen Vectors: Characteristic Equation, Eigen Values, Eigen Vectors, Cayley-Hamilton Theorem (without proof), verification and	5	CO5



	reduction of higher degree polynomials, Similarity of matrices, diagonalisable matrices		
6.	Combinatorics: Basics of counting, Permutation, permutation with repetition and Combinations, Pascal Triangle, Binomial Theorem	4	CO6

Text Books:

1. *Kenneth Hoffman and Ray Kunze, Linear Algebra, PHI Publication*
2. *N. S. Gopalakrishnan, University Algebra, Wiley Eastern Ltd., New Delhi 1994.*
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, Wiley Publication
4. Ralph P. Grimaldi, *Graph Theory and Combinatorics*, Pearson Education

Reference Books:

1. S. Kumaresan, *Linear Algebra: A geometric Approach*, PHI
2. Howard Antor and Chris Rorres, *Elementary Linear Algebra: Application Version*, Pearson
3. Bhattacharya, Jain and Nagpaul, *First Course in Linear Algebra*, New Age International Publishers
4. I. N. Herstein, *Topics in Algebra*, Wiley Publishers

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S2-3	Media & Entertainment -II	3	-	-	3	3

Course Objectives:

1. To explore the historical evolution and impact of television broadcasting in India.
2. To analyze the diverse genres and programming trends in Indian television.
3. To examine the role of television in shaping public opinion, values, and cultural norms in India.
4. To examine the regulatory frameworks governing television broadcasting in India.
5. To analyze the impact of digital transformation and the rise of Over-the-Top (OTT) platforms on the Indian media landscape.
6. To explore emerging trends and future prospects in the Indian television and media industry

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Comprehend the historical development and societal influence of television broadcasting in India.
2. Recognize the variety of television content and its significance in shaping audience preferences.
3. Understand the societal impact and cultural influence of television broadcasting in India.
4. Comprehend the regulatory mechanisms and challenges in the Indian television industry.
5. Understand the disruptive influence of OTT platforms and the digital revolution in media consumption.
6. Evaluate the potential opportunities and challenges posed by technological advancements and changing consumer behaviors.

Module No	Contents	Hrs. (30)	CO
1.	Evolution of Television Broadcasting - Early beginnings of television broadcasting in India. - Technological advancements and the transition from black-and-white to color television. - Pioneering programs and iconic moments in Indian television history. - Societal impact of television on culture, politics, and entertainment. - Challenges faced by the television industry and regulatory responses.	5	CO1
2.	Television Genres and Programming Trends - Overview of television genres: drama, comedy, news, reality TV, etc.	5	CO2



	- Analysis of popular television shows and their cultural significance. - Trends in programming formats and audience engagement strategies. - Impact of globalization on television content and formats. - Case studies of successful television programs and their audience appeal.		
3.	Television's Influence on Society and Culture - Representation of social issues and cultural diversity on television. - Influence of television on behavior, attitudes, and lifestyle choices. - Portrayal of gender roles, identities, and stereotypes in television programming. - Television as a tool for education, awareness, and social change. - Critiques of television content and its effects on society.	5	CO3
4.	Regulatory Frameworks in Television Broadcasting - Overview of regulatory bodies and their roles in overseeing television broadcasting. - Laws, regulations, and policies governing content, advertising, and ownership. - Challenges related to content censorship, self-regulation, and compliance. - Debates over media ownership, cross-media ownership, and monopolies. - Emerging issues in television regulation: digital piracy, fake news, etc.	6	CO4
5.	Digital Transformation and the Emergence of OTT Platforms - Evolution of digital media and its implications for traditional television broadcasting. - Growth of OTT platforms and their business models: subscription-based vs. ad-supported. - Original content production by OTT platforms and its impact on content diversity. - Changing viewer habits and the shift towards on-demand and personalized content. - Challenges and opportunities for traditional broadcasters in the digital era.	4	CO5
6.	Future Trends in Television and Media - Emerging technologies: augmented reality, virtual reality, artificial intelligence, etc. - Innovations in content delivery and immersive viewing experiences. - Impact of globalization, convergence, and digitalization on media ecosystems. - Predictions for the future of television: personalized content, interactive storytelling, etc. - Strategies for adapting to and thriving in the evolving media landscape.	5	CO6

Text Books:

1. Rajagopal, A., 2014. Television in India: Ideas, institutions and practices. *The SAGE Handbook of Television Studies*, pp.83-104.
2. Miller, T., 2009. *Television studies: The basics*. Routledge.
3. Evens, T. and Donders, K., 2018. *Platform power and policy in transforming television markets*. London: Palgrave Macmillan.



Reference Books:

1. Silverstone, R., 2003. *Television and everyday life*. Routledge.
2. Furht, B. ed., 2009. *Handbook of multimedia for digital entertainment and arts* (pp. 514-527). Springer.

Online Resources:

1. TRAI (Telecom Regulatory Authority of India)
<https://www.trai.gov.in/>
2. BARC India (Broadcast Audience Research Council)
<https://www.barcindia.co.in/>

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S2-12	Entrepreneurship Development	3	-	-	3	3

Course Objectives:

1. To explain concepts of Entrepreneurship and build an understanding about business situations in which entrepreneurs act.
2. To qualify students to analyse the various aspects, scope and challenges under an entrepreneurial venture.
3. To explain classification and types of entrepreneurs and the process of entrepreneurial project development.
4. To discuss the steps in venture development and new trends in entrepreneurship.

Course Outcomes: On successful completion of course, learner/student will be able to

1. Explain Foundation of Entrepreneurship Development and its theories.
2. Explore entrepreneurial skills and management function of a company with special reference to SME sector.
3. Identify the type of entrepreneur and the steps involved in a marketing entrepreneurial venture.
4. Recognize various steps involved in starting a venture.
5. Explore marketing methods & new trends in entrepreneurship for financial management.
6. Develop skills for entrepreneurship development and management using case studies..

Module No	Contents	Hrs. (30)	CO
1.	Entrepreneurship: Meaning and Importance, Factors influencing entrepreneurship, Characteristics of an entrepreneur, Types of entrepreneur, Barriers to entrepreneurship, Skills of an entrepreneur.	05	CO1
2.	Operations Management: Production Forecasting, Planning And Control, Integrative nature of Production Plans, Maintenance Management, Preventive maintenance system, Materials Management, Inspection & Quality Control, Inventory Management, Case Studies	05	CO2
3.	Marketing Management: Needs, Wants and Demands, Demand Management, Company Orientation, Environmental Scanning, Marketing Mix, New Product Development, Test Marketing, Product Life Cycle, Marketing Research and Consumer Behaviour, Sales Management And Promotion, Territory Management, Sales Promotional Techniques, Product Pricing, Advertising And Branding	05	CO3



4.	General Management & Business Environment: Schools of Management Thought, Classical Management School, Levels of Management, Functions of Management, Business and Environment, Business Environment in developed and developing countries, Business Ethics, Social Responsibility of business, Ecological Environment, Indian Business Environment, Co-Operative Management, International Business Environment.	05	CO4
5.	Financial Management: Accounting Process, Accounting Concepts & Conventions, Ledger, Understanding Financial Statement Working Capital : Determination & Calculation, Long-Term Source of Finance, Costing, Service Tax-Law & Practice.	05	CO5
6.	Case Studies & Problems: Analysis with B.E. Point and P/V Ratio, Preparation of Cash Budget, Problems on Standard Costing, Cash Flow Statement, Problem as Working Capital Requirement Forecast, Problems on Journal & Ledger.	05	CO6

Text Books:

1. R. K. Singal , “Entrepreneurship Development & Management”, S.K. Kataria & Sons, January 2013
2. Norman M Scarborough, “Essentials Of Entrepreneurship And Small Business Management”, 8TH Edition, Pearson, November 2015

Reference Books:

1. S.S.Khanka, C.B.Gupta CB, “Entrepreneurship and Small Business Management” Sultan Chand & Sons, 2023.
2. Vasant Desai, “Entrepreneurship: Development and Management”, Himalaya Publishing House, 2015.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Practical	Total
FY-BCA-S2-13	Data Analysis Using Ms-Excel	3	-	-	3	3

Course Objectives:

1. Enable participants to become proficient Excel users, enhancing job efficiency and analytical skills.
2. Equip participants with the capability to import and merge data from diverse sources within Excel.
3. Enable participants to organize data visually within Excel for improved presentation and comprehension.
4. Empower participants to analyze data effectively in Excel, extracting actionable insights vital for informed decision-making in business scenarios.
5. Develop proficiency in using logical functions for precise data analysis and decision-making.
6. Acquire expertise in Excel data validation techniques to ensure accuracy and reliability in data handling and analysis.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. An understanding of how to apply most commonly used statistical and lookup functions.
2. The ability to gather data and organize the data for analysis in business. Knowledge in chart generation and interpretation.
3. The ability to build dashboards using PivotTables and PivotCharts.
4. Skills in using Excel What-If Analysis and Data Analysis tools for generating different scenarios of business environment and aiding decision making.
5. Students will adeptly employ logical functions such as IF, IFERROR, IFNA, nested IF, and complex IF/OR functions for data analysis tasks.
6. Students will master various techniques including number, date & time, text, list validation, custom validations, dynamic dropdown list creation, and dependency list implementation for precise data validation

Module No	Contents	Hrs. (30)	CO
1.	Collecting and Managing Data:- - Getting external data from various sources. - Preparing data using text manipulation.	5	CO1

	- Using statistical functions and formulae. - Extracting data with lookup functions. - Formatting and conditional formatting. - Tapping into real data from the Internet for business analysis		
2.	Constructing Charts - Plotting different types of charts. - Customising charts for presentations. - Using Sparklines.	4	CO2
3.	Building Dashboard using PivotTables and PivotCharts. - Understanding and use of Excel tables. - Creating Pivot Tables to analyze worksheet data. - Creating dashboards using Pivot Charts for visual presentation. - Adding Slicers and Timelines for interactive display. - Introducing multi-table PivotTables and data model.	6	CO3
4.	Decision making using What-If Analysis. - Building Data Tables. - Building charts from Data Tables. - Using Scenario Manager for reporting different scenarios. - Exploring Data Analysis tools.	5	CO4
5.	Logical Functions - If Function - How to Fix Errors – if error - Nested If - Complex if and or functions	5	CO5
6.	Data Validation - Number, Date & Time Validation - Text and List Validation • Custom validations based on formula for a cell - Dynamic Dropdown List Creation using Data Validation - Dependency List	5	CO6

Text Books:

- Data Analysis and Business Modeling with Excel 2013 by David Roja
- Guerrilla Data Analysis Using Microsoft Excel: 2nd Edition Covering Excel 2010/2013 by Oz du Soleil, Bill Jelen
- Excel Data Analysis: Modeling and Simulation by Hector Guerrero
- Decision Analytics: Microsoft Excel by Conrad Carlberg

Reference Books:

- Decision Analytics: Microsoft Excel by Conrad Carlberg
- Marketing Analytics: Data-Driven Techniques with Microsoft Excel by Wayne L. Winston



Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S2-6	AEC: English II	2	-	-	2	2

Course Objectives:

1. To develop a foundational understanding of the communication process and its components.
2. To enhance business communication skills, particularly in the context of formal letter writing.
3. To cultivate technical writing skills necessary for clear and concise communication in various fields.
4. To master the art of essay writing, including structuring and developing cohesive arguments.
5. To equip students with the ability to conduct SWOT analyses for personal, career, business, and product development.
6. To empower students with the knowledge and skills to present themselves professionally in various contexts.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Students will be able to identify and overcome barriers to effective communication.
2. Students will demonstrate proficiency in crafting various types of business letters following appropriate formats.
3. Students will exhibit competence in technical writing through clear definition framing and process description.
4. Students will be capable of producing well-structured and coherent essays on diverse topics.
5. Students will apply SWOT analysis effectively to evaluate personal, career, business, and product strategies.
6. Students will present themselves professionally through appropriate appearance, grooming, and online presence.

Module No	Contents	Hrs. (30)	CO
1.	Basic Concepts of Communication • Meaning and Definitions of Communication • Understanding the Communication Process • Methods of Communication • Barriers to Effective Communication • Network of Communication	6	CO1



2.	Advanced Business Letter Writing - Principles of Business Letter Writing - Formats: Complete Block and Modified Block - Types of Business Letters: Enquiry, Reply to Enquiry, Orders, Claim Adjustment, Sales	4	CO2
3.	Technical Writing - Framing Technical Definitions - Writing User Instructions - Technical Object and Process Description	5	CO3
4.	Essay Writing Techniques - Understanding Essay Types - Paragraph Development - Structuring Essays Effectively	5	CO4
5.	SWOT Analysis Effective SWOT Analysis - Understanding SWOT Analysis in Personal, Career, Business Idea, and Product Development - Identifying Strengths, Weaknesses, Opportunities, and Threats - Strategic Utilization of SWOT Analysis for Decision Making	5	CO5
6.	Presenting Yourself Professionally - Managing Your Image - Dressing Appropriately - Good Grooming and Hygiene - Interacting with Others Professionally - Crafting an Effective Online Persona	5	CO6

Text Books:

1. Communication Skills : Meenakshi Raman and Sangeeta Sharam , Oxford Publications.

Reference Books:

1. Communication in Everyday Life: A Social Interpretation" by Steve Duck and David T. McMahan –
2. "Business Communication: Building Critical Skills" by Kitty Locker and Stephen Kyo Kaczmarek
3. "Technical Communication: A Reader-Centered Approach" by Paul V. Anderson
4. "The Norton Field Guide to Writing: with Readings and Handbook" by Richard Bullock, Maureen Daly Goggin, and Francine Weinberg
5. "SWOT Analysis: The Ultimate Guide to SWOT Analysis" by Ryan Smith –



Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
FY-BCA-S2-14	Environmental Studies	2	-	-	2	2

Course Objectives:

1. To develop an cohesive approach to environmental issues with a emphasis on sustainability
2. To enable learners to recognize the physical, chemical, and biological components of the earth's systems and relate their interdependence
3. To understand problems of environmental pollution, its impact on human and ecosystem and control measures.

Course Outcomes:

On successful completion of course, learner/student will be able to:

- CO1: Implement scientific, technological and economic solutions to environmental pollution
- CO2: Apply the idea to solve the problems of environmental pollution, its impact on human and ecosystem and control measures
- CO3: Identify and develop different kinds of eco-friendly measures on personal and social level
- CO4: Develop sustainable interaction methods among humans and raise public awareness for environment
- CO5: Interpret and apply elementary environmental regulations and to assess socio-environmental conditions.
- CO6: Apply techniques to reduce pollution and manage natural disasters.



Module No	Contents	Hrs. (30)	CO
1.	The Environment: The Atmosphere, Hydrosphere, Lithosphere, Biosphere, Ecology, Ecosystem, Biogeochemical Cycle (Carbon Cycle, Nitrogen Cycle), Environment Pollution: Air Pollution, Water Pollution, Soil Pollution, Radiation Pollution.	5	CO1
2.	Population Ecology: Individuals, Species, Pollution, Community, Control Methods of Population, Urbanization and its effects on Society, Communicable Diseases and its Transmission, Non-Communicable Diseases.	5	CO2
3.	Environmental Movements in India: Grassroot Environmental movements in India, Role of women, Environmental Movements in Odisha, State Pollution Control Board, Central Pollution Control Board.	5	CO3
4.	Natural Resources: Conservation of Natural Resources, Management and Conservation of Wildlife, Soil Erosion and Conservation	5	CO4
5.	Environmental Laws: Water Act, 1974, Air Act, 1981, The Wildlife (Protection) Act, 1972, Environment Protection, 1986,	5	CO5
6.	Natural Disasters and their Management Carbon Credit: Introduction and general concept. Techniques of Disaster Management to cope up with (i) Earthquake and (ii) Flood. Case Study on Earthquake in Latur (Maharashtra, India), Case Study on Cloudburst and Landslides at Kedarnath (Uttarakhand, India)	5	CO6

Text Books:

1. Renewable Energy by Godfrey Boyle, Oxford Publications.
2. Textbook of Environmental Studies by Dave and Katewa, Cengage Learning.
3. Textbook of Environmental studies by Erach Bharucha, University Press.
4. Environmental pollution control engineering by C.S. Rao, New Age International (P) Limited Publishers.

Reference Books:

1. Doebelin E.D., Measurement system, Tata McGraw Hill., 4th ed, 2003.
2. Bela G. Liptak, Instrument Engineers' Handbook, Fourth Edition, Volume One: Process Measurement and Analysis, June 27, 2003.
3. Neubert Hermann K. P., Instrument Transducer, 2nd ed., Oxford University Press, New Delhi, 2003
4. Environmental Studies by. Anandita Basak, Pearson Education.



5. Essentials of Environmental Studies by Kurian Joseph & Nagendran, Pearson Education.
6. Fundamentals of Environmental Studies by Varadbal G. Mhatre, Himalaya Publication House.
7. Perspective of Environmental Studies, by Kaushik and Kaushik, New Age International.



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Semester III Syllabus

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S3-15	Database System Management	3	-	-	3	3

Course Objectives:

1. Learn and practice data modelling using the entity-relationship and developing database designs.
2. Understand the use of Structured Query Language (SQL) and learn SQL syntax.
3. Apply normalization techniques to normalize the database.
4. Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access.
5. Learn advanced representations of databases suited for real-time applications.

Course Outcomes: At the end of the course learner will able to

1. Understand the fundamentals of database systems and design ER for the real life problem.
2. Convert conceptual model to relational model, formulate relational algebra queries.
3. Analyze and apply concept of normalization to relational database design.
4. Design and querying database using SQL.
5. Perform PL/SQL programming using concept of cursor management, Triggers, stored procedures and functions.
6. Understand the concept of transaction, concurrency and recovery management system.

Module No	Contents	Hrs. (45)	CO
1.	Introduction to Database Management System Introduction, file processing system Vs DBMS, Challenges in building a DBMS and advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture	6	CO1
2.	Data Models Introduction , evolution of data models, importance of data models, Basic building blocks, Data Models : Object Based Logical Model, Record Based Logical Model (Relational Model , Network Model ,Hierarchical Model)	8	CO2
3.	Database Design ,ER-Diagram and Unified Modelling Language Database design and ER Model: overview, ER-Model, Constraints, ER-Diagrams(ERD), Issues, weak and strong entity sets, Entity Relationship Diagram (ERD) ,Extended features of ERD	9	CO3



	Relational database model: Logical view of data, keys, integrity rule, Relational Database design functional dependencies. Normalization (1NF, 2NF, 3NF, BCNF, 4NF, 5NF).		
4.	Relational Algebra Relational algebra: introduction, Keys (Super Key ,Candidate Key , Primary Key ,Foreign Key) Selection and projection, set operations, Operations(Select Project, Union, Difference, Intersection , Cartesian Product, Natural Join)	7	CO4
5.	Structured Query Language (SQL) Constraints, types of constraints, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joins, relations. Triggers. SQL statements (commands) – DDL, DML, DTL and DCL.	8	CO5
6.	Transaction management and Concurrency Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.	7	CO6

Text Books:

1. G. K. Gupta, “Database Management Systems”, McGraw – Hill.
2. Korth, Silberchatz, Sudarshan, “Database System Concepts”, 6th Edition, McGraw – Hill
3. Elmasri and Navathe, “Fundamentals of Database Systems”, 5th Edition, Pearson education.

Reference Books:

1. Dr. P.S. Deshpande, “SQL and PL/SQL for Oracle” 10g, Black Book, Dreamtech Press.
- 2.
2. Gillenson, Paulraj Ponniah, “Introduction to Database Management”, Wiley Publication.
3. Sharaman Shah, “Oracle for Professional”, SPD.
4. Raghu Ramkrishnan and Johannes Gehrke, “Database Management Systems”, TMH.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S3-16	OOP- Java	3	-	-	3	3

Course Objectives:

1. To interpret core concepts object-oriented programming using Java as a programming language.
2. To help students to analyze and construct well designed and effective applications using Java.
3. To demonstrate skills in writing programs using exception handling techniques and multithreading.
4. To understand streams and efficient user interface design techniques.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Understand the Basics of Object-Oriented Programming
2. Understand constructing application using Java.
3. To implement Inheritance and polymorphism concepts in a program
4. To identify and handle exceptions that occurs in the programs.
5. To construct GUI using building classes.
6. To understand Database connectivity in Java.

Module No	Contents	Hrs. (45)	CO
1.	Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java. Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference.	09	CO1
2.	Constructors : “this” keyword, “static” Keyword, Method Overloading Concept of Constructor, Types of Constructors, Constructor Overloading, Constructor Nesting, Garbage Collection and Finalization	09	CO2
3.	Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.	09	CO3



4.	Exceptions Handling : Introduction, Exception Handling, Exceptions, and types, try catch, finally, throw, Concept of throw & catch with example.	04	CO4
5.	Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle,	07	CO5
6.	Java Database Connectivity: Types of Drivers Registering Drivers, Driver class, Driver Manager Class Statements – Query Statement, Prepared Statement, Callable Statements Result Set	07	CO6

Text Books

1. Programming with Java, By E Balagurusamy – A Primer, Fourth Edition, Tata McGraw Hill Education Private Limited.
2. Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall
3. Data Warehousing and - 2 - - 2 - 2 Data Management Lab Programming with Java : Somashekara, M.T., Guru, D.S., Manjunatha, K.S

Reference Books:

1. Java 2 - The Complete Reference – McGraw Hill publication.
2. Java - The Complete Reference, 7th Edition, By Herbert Schildt– McGraw Hill publication.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S3-17	Elements of Statistics	3	-	-	3	3

Course Objectives: (4 to 6 Objectives)

1. To provide the requisite and relevant background necessary to understand other important mathematics courses offered for Computer Applications
2. To provide the statistical techniques for understanding the data related real life problems.
3. Fostering the understanding through real-world statistical applications with probability.
4. To make students familiarize with the random experiments and their analysis through hypothesis.

Course Outcomes: (6 Outcomes)

On successful completion of course, learner/student will be able to

CO1: Demonstrate basic statistics, Central tendency and measure of spread.

CO2: Apply the knowledge and skills to investigate the relation of real-life problems using Correlations and regression

CO3: Demonstrate the knowledge and skills to investigate the relation of real-life data using curve fitting.

CO4: Illustrate the knowledge and skills to investigate the real-life problems using probability.

CO5: Express the features of random variables with their distributions to solve various problems.

CO6: Demonstrate an understanding of sampling theory and applications in real life.

Module No	Contents	Hrs. (30)	CO
1.	Measure of Central tendency: Mean, Median and Mode, quartiles, percentiles. Measure of Spread: Range, quartile deviation, mean deviation, variance, covariance and standard deviation.	5	CO1
2.	Statistical Techniques: Karl Pearson's Coefficient of correlation (r), Spearman's Rank correlation coefficient (R) (with repeated and non-repeated ranks), Lines of regression of X on Y and Y on X	5	CO2
3.	Curve Fitting: Fitting of first degree (line) curve, second degree (parabola) curve and fitting of exponential curve.	5	CO3



4.	Probability: Definition and basics of probability, conditional probability, Total Probability Theorem and Baye's theorem Discrete and continuous random variable with probability distribution and probability density function. Expectation of random variables with mean, variance and standard deviation	5	CO4
5.	Probability Distribution: Binomial Distribution, Poisson distribution, Normal distribution	4	CO5
6.	Sampling Theory: Test of Hypothesis, Level of Significance, Critical region, One-tailed, and two-tailed test, Degree of freedom, Students' t-distribution (Small sample). Test the significance of mean and Difference between the means of two samples. Chi-Square Test: Test of goodness of fit and independence of attributes, Contingency table.	6	CO6

Text Books:

1. Dr. S. P. Gupta, Statistical Methods, S. Chand Publications
2. B. C. Agrawal, Basics of Statistics, New Age International Publications
3. Vijay Rohatgi and A. K. Saleh, Introduction to Probability and Statistics, Wiley Publications

Reference Books:

1. J. N. Kapur and H. C. Saxena, Mathematical Statistics, S. Chand Publications
2. Peter Bruce, Andrew Bruce, and Peter Gedeck, Practical statistics for data scientists, O'Reilly Publications
3. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers , and Keying E. Ye, Probability and Statistics for Engineers and Scientists , Pearson Publications
4. Kishor S. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications,

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S3-18	Discrete Mathematics	3	-	-	3	3

Course Objectives: (4 to 6 Objectives)

1. To discuss the concepts associated with logic, propositions, predicate calculus and their applications.
2. To discuss the concepts and terminologies for algorithms and integers.
3. To describe relations, functions and their properties.
4. To discuss the concepts and terminologies associated with graph theory.

Course Outcomes: (6 Outcomes)

On successful completion of course, learner/student will be able to

- CO1. Understand logic, propositions and predicate calculus.
 CO2. Apply different algorithms for integers, natural numbers and induction.
 CO3. Perform operations on sets and solve problems in real life.
 CO4. Apply relations in Problem solving.
 CO5. Use basics of functions for design and solving related problems.
 CO6. Apply knowledge of graph theory for design and solve real life problems.

Module No	Contents	Hrs. (30)	CO
1.	Logic and Proofs: Propositional logic, equivalences using truth tables, Predicates and quantifiers, Nested quantifiers, Rules of inference, Introduction to proofs, Proof methods	05	CO1
2.	Algorithms and Integers: Growth of functions, Complexity of integers and divisions, Primes and GCD, Mathematical Induction, well Ordering principle.	05	CO2
3.	Set Theory: Introduction to set Theory, counting principle, cardinality and countability (Countable and Uncountable sets), Venn Diagram, Inclusive and Exclusive Principles, Pigeonhole principle and extended pigeonhole principle.	05	CO3
4.	Relation: Definition of relation, Cartesian products, power sets, set representation of relation, graphical representation of relation, matrix representation of relation, reflexive, irreflexive, symmetric, asymmetric, antisymmetric, transitive and equivalence relations, partial order relation	05	CO4



5.	Function: Definition of function, one-one function, onto function, bijective function, inverse of function, composition of functions.	05	CO5
6.	Graph theory: Definition of Graph, Graph representation, terminology, Connectivity, Path, Walk, Circuit, Euler and Hamiltonian paths, Eulerian and Hamiltonian Graphs, Planar Graphs. Trees, Maximum and Minimum height of trees	04	CO6

Text Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, McGraw Hill Education (India) Pvt. Ltd., 2011
2. B. Kolman, R. C. Busby, S. C. Ross, Discrete Mathematical Structures for Computer Science, Prentice Hall of India , (Also available in Pearson)
3. C. L. Liu, and D. P. Mohapatra, Elements of Discrete Mathematics: A Computer-Oriented Approach, McGraw Hill Education (India) Pvt. Ltd., 2013

Reference Books:

1. Jean Paul Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Sciences, McGraw Hill Education, 2017
2. M. K. Das, Discrete Mathematical Structures for computer Scientists and Engineers, Narosa Publications.
3. C. L. Liu, Elements of Discrete Mathematics, McGraw Hill Education (India) Pvt. Ltd.,
4. N. Deo, Graph Theory with applications to Engineering & Computer Science, PHI , 2006



Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S3-19	Enterprise Resource Planning	3	-	-	3	3

Course Objectives:

1. To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning Technology.
2. To focus on a strong emphasis upon practice of theory in Applications and Practical oriented approach.
3. To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.
4. To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Make basic use of Enterprise software and its role in integrating business functions
2. Analyze the strategic options for ERP identification and adoption.
3. Design the ERP implementation strategies.
4. Create reengineered business processes for successful ERP implementation.
5. Understand the need of Business Systems and Processes through strategic analysis of ERP systems
6. Demonstrate a good understanding of the basic issues in ERP systems

Module No	Contents	Hrs. (30)	CO
1.	ERP-Introduction; Advantages; ERP and Business – value creation; Integrated Information Management; Enterprise and ERP, Business modeling; Integrated data model. To ERP or not to ERP – Strategic Options; Benefits of ERP.	4	CO1
2.	Quantifiable, Intangible; P&G; Risks: People, process, Technology, Implementation, Operational and Managerial risks.	5	CO2
3.	Introduction to ERP related technologies; Functional modules of ERP software.; Implementation of ERP: Life cycle; Implementation methodologies,	6	CO3



	transition strategies; People involved in implementation; Success and failure in implementation – factors. Operation and Maintenance of an ERP system.;		
4.	ERP Market: Introduction, SAP AG, Baan Company, Oracle Corporation, People Soft, JD Edwards World Solutions Co, System Software Associates, Inc. (SSA); QAD; A Comparative Assessment and Selection of ERP Packages and Modules.	5	CO4
5.	Selection of ERP Vendors: Vendors; Consultants and Users; In-House Implementation - Pros and Cons; Future Directions in ERP : New Markets; New Channels; Faster Implementation Methodologies;	5	CO5
6.	Other Related Technologies of SCM: E-Procurement; E-Logistics; Internet Auctions; E-markets; Electronic Business Process Optimization; Business Objects in SCM; E commerce.	5	CO6

Text Books:

1. Enterprise Resource Planning – Alexis Leon – Second Edition – TMH
2. Ellen Monk, Bret Wagner, Concepts in Enterprise resource planning, Cengage learning, Third edition, 2009.

Reference Books:

1. ERP in practice – Vaman - TMH
2. Daniel E.O’Leary, Enterprise Resource Planning Systems, Cambridge University Press, 2002.



Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S3-20	Computer Hardware and Assembly	2	-	-	2	2

Course Objectives: (4 to 6 Objectives)

1. Acquire confidence in the identification of various types of BIOS and processors.
2. Acquire knowledge of Motherboard, Form Factor, and in-depth analysis of Mother Board & its Reliability.
3. Acquire knowledge in basic Principles and Operation of Primary and Secondary Memory.
4. Acquire knowledge of Bus Definition and Physical Identification and Applications of Ports and Buses on Motherboard.

Course Outcomes: (6 Outcomes)

On successful completion of course, learner/student will be able to

1. Identify of various types of BIOS and processors.
2. Understand Motherboard, Form Factor, and in-depth analysis of Mother Board & its Reliability.
3. Understand the Principles and Operation of Primary and Secondary Memory.
4. Acquire knowledge of Bus Definition and Physical Identification and Applications of Ports and Buses on Motherboard.
5. Diagnose network problems using various Network Software and commands
6. Diagnose tools for various operating system like Windows and Linus

Module No	Contents	Hrs. (30)	CO
1.	Introduction: Hardware and software- the BIOS (UEFI Unified Extensible Firmware Interface and EFI Extensible Firmware Interface) hardware interaction, the importance of BIOS, BIOS functions configuration of a general purpose computer, i3,i5,i7, and i9 Compatible, identification of various components on the motherboard.	5	CO1
2.	System Board: Motherboard- motherboards based on the form factor: such as AT, ATX, micro ATX, mini ATX, Baby AT, BTX, NLX, various I/O ports, and expansion cards available on the motherboard.	5	CO2
3.	Primary and Secondary Storage:	5	CO3



	Primary Storage – Working of RAM, ROM, Processor Register, Processor Cache, Virtual Memory, DDR2, DDR3, EPROM, EEPROM and Video Memory. Secondary storage devices - Hard disk Drive, jumper settings, hard disk interfacing standards like IDE/SCSI /SATA / PATA, Solid State Drives (SSD), various disk drives CD-ROM, CD- Writer, Combo drive, DVD Drive, Blu-Ray, BD-R, BD-RE, BD-Dc, Pen drive, RAID types.		
4.	Buses & I/O Ports: Bus Definition, System and I/O Bus, its Types, Operation and Applications, Port Definition, Operations, Applications, and its types - External and Internal Ports, Operation and Application of Parallel (LPT) and Serial Port (COM), Operation and Applications of Address, Data and Control Bus.	5	CO4
5.	Network Device: Operation and Application of Cables - Twisted Pair (Shielded and Non Shielded), Coaxial Cable (Thicknet and Thinnet), Optic Fiber Cables (Single and Multi-Mode), Cable Gauge and Labelling, Operation and Application of Network Hardware Devices - NIC Card, Hub, Switches, Routers, Access Point, Modem and Gateway, Troubleshooting Fault Tree for Network Hardware Devices.	5	CO5
6.	System Diagnostic Tools: Diagnostic Tools Definition, Application of Windows OS Diagnostic Tools for Task Scheduler, Event Viewer, Shared Folder, Disk Management Services, Memory Diagnostic Windows OS Diagnostic Command for Resource, Performance and Memory – perfmon, perfmon /report and mdsched, Linux OS Diagnostic Command – htop, vmstat, iotop, lscpu, hwinfo, lspci, lsscsi, lsusb, lsblk, fdisk and free.	5	CO6

Text Books:

1. Upgrading and Repairing PCs Author : Scott Mueller Edition : 22nd Edition Publisher : Que
2. Internetworking Technology: An Engineering Perspective Author : Rahul Banerjee
Publisher : Prentice Hall

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Practical	Total
SY-BCA-S3-21	Business Communication	3	-	-	3	3

Course Objectives:

1. To develop proficiency in writing clear and concise business and technical reports.
2. To enhance skills in crafting technical papers with clarity and precision.
3. To equip students with the knowledge and tools necessary for effectively managing and facilitating business meetings.
4. To cultivate critical thinking skills for analyzing information and making informed decisions.
5. To improve group communication and presentation skills for effective collaboration and formal presentations.
6. To empower students with techniques for group decision-making, assertiveness, and problem-solving in professional contexts.

Course Outcomes: On successful completion of course, learner/student will be able to

1. Students will be able to produce well-structured and informative business and technical reports tailored to specific audiences.
2. Students will demonstrate the ability to write technically sound papers with appropriate citations and visuals.
3. Students will acquire the skills to plan, conduct, and document effective business meetings.
4. Students will develop critical thinking skills to analyze arguments, identify logical fallacies, and make reasoned judgments.
5. Students will exhibit proficiency in group discussion facilitation and formal presentation delivery.
6. Students will demonstrate competence in collaborative decision-making, assertive communication, and problem-solving within group settings.



Module No	Contents	Hrs. (30)	CO
1.	Business and Technical Report Writing Components: Understanding the Purpose & Scope of Reports, Structure of Reports , Types of Reports, Language and Styles of Report, Short Report(Letter and Memo) , Project Report	5	CO1
2.	Technical Proposal Writing Structure and Types of Proposal, Drafting a Technical Proposal	4	CO2
3.	Managing Business Meetings - Components: Planning and Scheduling Meetings, Setting Agendas ,Drafting Notice, Facilitating Discussions, Preparing Minutes. - Strategies of Successful Meetings	6	CO3
4.	Critical Thinking Components: Analyzing Information, Evaluating Arguments, , Cognitive Biases to Critical Thinking, Making Sound Judgments.	6	CO4
5.	Group Discussion and Formal Presentations Components: Effective Group Communication Strategies, Structuring Formal Presentations, Strategies of Effective formal Presentations	5	CO5
6.	Group Decision Making, Assertiveness, and Problem Solving Components: Understanding Group Dynamics, Assertive Communication Techniques, Collaborative Problem Solving, Decision-Making Strategies.	4	CO6

Text Books:

1. Soft Skills for Everyone by Jeff Butterfield , CENGAGE Learning

Reference Books:

1. Writing That Works: How to Communicate Effectively In Business" by Kenneth Roman and Joel Raphaelson.
2. Writing for Computer Science" by Justin Zobel
3. The Effective Meeting Planner: How to organize and cover all your meeting contents" by Kevin J. Martin.
4. Critical Thinking: An Introduction" by Alec Fisher



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Semester IV Syllabus

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S4-22	Computer Network	3	-	-	3	3

Course Objectives:

1. Understand the TCP/IP and OSI protocol suite's architecture and principles.
2. Analyze the behavior and functionality of OSI protocol stack.
3. Design and implement networked systems using OSI protocol stack.
4. Apply networking principles to solve real-world networking problems.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Explain the architecture and principles of the TCP/IP protocol suite.
2. Analyze the behavior and functionality of the Data link layer for wired networks.
3. Design and implement networked systems based on network layer features.
4. Collaborate effectively in network design and analysis in the transport layer.
5. Analyze features and use of Application layer protocols.
6. Apply networking knowledge to solve practical networking challenges.

Module No	Contents	Hrs. (45)	CO
1.	Networking Today: Networking fundamentals, OSI and TCP/IP models, Network Concepts: Network Representations and Topologies, peer to peer communication, Common Types of Networks, Reliable Networks: Network Architecture, Fault Tolerance, Scalability, Security. Physical Layer: Components: Signaling and cabling in data transmission, Data Access: Encapsulation and Decapsulation.	7	CO1
2.	Data Link Layer: Introduction, Data link Control: Flow control and framing, Error detection and correction, Multi-Access Protocol: Random, Control and Channelization, medium access control protocol, Link layer addressing and standards, Address resolution protocol (ARP).	8	CO2
3.	Network Layer: Introduction, Network layer services, packet switching and performance, Datagram Format: IPv4, Protocols: IPv4 Subnetting and addressing, Routing algorithms: Distance Vector, Link state, RIP, BGP, OSPF New generation IP: IPv6 subnetting and addressing.	8	CO3



4.	Transport Layer: Introduction, Port Addressing, Transport layer protocol: Stop-N-Wait, Go-back-N, Selective repeat, Piggybacking. UDP datagram protocol: Header, Application and services TCP Segment: Header, State transition diagram, flow control, error control and congestion control.	8	CO4
5.	Application layer: Introduction: Application of Programming Interface, Compression techniques: Lossy and lossless, Standard client-server application- HTTP, FTP, SMTP, DNS, DHCP, TELNET, SSH.	8	CO5
6.	Network Design and Management: Network design and optimization, SNMP protocol, Quality of Service (QoS), Troubleshooting techniques: Information Gathering, Analysis and Planning,	6	CO6

Text Books:

1. William Stallings, Network Security Essentials: Applications and Standards, Pearson Education, 2018, 6th Edition.
2. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, McGraw Hill, 2022, Standard Edition.

Reference Books:

1. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 2010, Pearson, 5th Edition.
2. W. Richard Stevens, TCP/IP Illustrated, Volume 1: The Protocols, Pearson Education India, 2011, 2nd Edition .
3. Steve McQuerry, CCNA self Studying, Cisco Press, 2003, 2nd Edition.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S4-23	Operating Systems	3	-	-	3	3

Course Objectives:

1. Understand the fundamentals of operating system architecture, structure, services and types.
2. Analyze the process management and thread management in operating system
3. Examine the scheduling strategies for CPU, Disk. and to analyze deadlock and its mitigation.
4. Understand the concepts of memory management, file system, storage management and operating system security techniques.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Understand the basic concepts and functions of operating systems
2. Analyze the relevant process and thread concepts for solving synchronization problems
3. Exemplify different types of scheduling algorithms and deadlock mechanism
4. Analyze the performance of different algorithms used in management of memory
5. Illustrate the storage management techniques for disk performance, file system and I/O management
6. Examine the operating system security requirements and relevant protection mechanisms.

Module No	Contents	Hrs. (45)	CO
1.	Introduction Need for Operating System, Von Neumann Architecture, OS Structure, operations and services, System Calls and its types, Types of OS and OS generations, Operating System Design and Implementation, Kernel Data Structures OS Debugging, System Boot	5	CO1
2.	Process Management Process Concept, Process State Transition, Process Scheduling, Operations on Processes, Interprocess Communication, Communication in Client– Server Systems, Threads: Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues. Process Synchronization: The Critical-Section Problem, Peterson’s Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors	9	CO2



3.	CPU Scheduling Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling. Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock	8	CO3
4.	Memory Management Main Memory, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table. Virtual Memory: Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory.	8	CO4
5.	Storage Management and File System I/O hardware, Application I/O interface, Kernel I/O Subsystem, Transferring I/O requests to Hardware Operations, Streams Storage Management: Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure. File- System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection. Special Purpose Operating Systems	9	CO5
6.	Operating System Security and Protection Security: The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Protection: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of the Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection	6	CO6

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, “Operating System Concepts”, John Wiley & Sons (Asia) Pvt. Ltd
2. Ramez Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach “, Tata McGraw Hill Edition,

Reference Books:

1. Dhananjay M. Dhamdhare, “Operating Systems – A Concept Based Approach”, Third Edition, Tata McGraw Hill Edition, 2019
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Fourth Edition, Global Edition, Pearson, 2015.
3. William Stallings, “Operating Systems: Internals and Design Principles”, Pearson Education, Sixth Edition, 2018.
4. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education, 2017.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S4-24	Microprocessor and Microcontroller	3	-	-	3	3

Course Objectives:

The student would be able to:

1. Differentiate between the microprocessor and microcontroller.
2. Design microprocessor and microcontroller-based solutions to problems.
3. Develop an understanding of assembly language and interfacing techniques.
4. Apply this knowledge to more advanced structures.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Understand the architecture and organization of 8086.
2. Write and develop the assembly language programs of 8086.
3. Design the circuits for interfacing various devices.
4. To understand the architecture of 8051 microcontroller.
5. To write the programs by use of a PC based microcontroller simulator.
6. Apply this knowledge to more advanced microcontrollers.

Module No	Contents	Hrs. (30)	CO
1.	Introduction to 8086 : Microprocessor architecture, Register Organization, Architecture, Memory Organization, Operation Bus, Stacks, Interrupts & Service Routines	4	CO1
2.	PROGRAMMING OF 8086 : Addressing Modes, Instruction Format-Instruction Set, Assembly language Programs in 8086.	5	CO2
3.	INTERFACING DEVICES : IO and Memory Interfacing concepts, Programmable Peripheral Interface (8255), Programmable Interrupt Controller (8259A) , Programmable DMA Controller (8257), Programmable Keyboard and Display Controller (8279)	6	CO3
4.	MICROCONTROLLER-8051 : Register Set Architecture of 8051 microcontroller IO and Memory Addressing Interrupts.	4	CO4
5.	PROGRAMMING OF 8051 : Instruction Set, Addressing Modes , Introduction to Embedded C Programming Timer , Serial Communication Interrupts Programming , Interfacing to External Memory	6	CO5



6.	HIGH PERFORMANCE RISC ARCHITECTURE- INTRODUCTION : ARM organization and implementation , The ARM instruction set (Elementary only) The thumb instruction set(Elementary only) , Basic ARM ALP (32-bit addition, subtraction, multiplication, binary sorting)	5	CO6
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Text Books:

1. Doughlas.V.Hall, “ *Microprocessor and Interfacing : Programming and Hardware*”, 2nd edition, McGraw Hill, 1991.
2. Kenneth.J.Ayala, “*8051 Microcontroller Architecture, Programming and Applications*”.2nd edition,Thomson.
3. A.K.Ray and K.M.Bhurchandi, “*Advanced Microprocessors anPeripherals*”,TataMcGrawHill,2000.
4. Muhammad Ali Mazidi and Janice Gillispie Mazidi, “ *The 8051 – Microcontroller and Embedded systems*”,7th Edition, Pearson Education , 2004

Reference Books:

1. David Seal, “ARM Architecture Reference Manual”, Pearson Education, 2007.
2. Michael J. Pont, “Embedded C”, Addison Wesley, 2002.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S4-25	Theory of Automata	3	-	-	3	3

Course Objectives:

1. To explore the formal languages and classify machines by their power to recognize languages
2. To focus on the study of abstract models of computation.
3. To understand computability theory as well as the complexity theory.
4. To develop the ability to form abstract computing models.
5. To solve complex problems in science and engineering through computing.
6. To design computation models and understand their properties.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Design deterministic and non-deterministic finite Automata for given problem.
2. Design regular expressions representing or generating a certain language
3. Simplify automata and context-free grammars
4. Design push down automata for given complex CFL.
5. Design Turing machine as acceptor and verifier for mathematical computations.
6. Understand the concept decidability.

Module No	Contents	Hrs. (30)	CO
1.	Finite Automata: Alphabets, strings, languages, Deterministic finite automata, non deterministic finite automata, finite automata with epsilon transitions, finite automata with output: Mealy and Moore machines.	6	CO1
2.	Regular Expressions and Regular Grammar: Regular expressions, DFA to regular expressions, regular expressions to finite automata, Grammar-Right linear grammar, left linear grammar.	4	CO2
3.	Context-Free Grammars and Languages: CFGs, Properties of Context-Free Languages derivation trees (parse tree), Ambiguous grammar, simplification, Chomsky normal forms.	5	CO3
4.	Pushdown Automata: Formal Definition, designing PDA's, acceptance by empty stack, acceptance by final state relationship between PDA and context free languages.	5	CO4



5.	Turing Machine: Turing Machines: The Turing machine model, techniques for Turing machine construction, modification of Turing machines.	5	CO5
6.	Un-decidability: Properties of recursive and recursively enumerable languages, post correspondence problem, Chomsky Hierarchy: regular grammars.	5	CO6

Text Books:

1. Hopcroft, Motwani, and Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Publishers, Third Edition, 2006.
2. P. Linz, “Introduction to Formal Language and Computation”, Narosa, 2nd Ed, 2006.

Reference Books:

1. Dexter C. Kozen, “Automata and Computability”, Springer Publishers, 2007.
2. Mishra & Chandrasekharan, “Theory of computer science: Automata language and computation”, Prentice Hall of India , 3rd Ed, 2007.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
SY-BCA-S4-26	Project Management	3	-	-	3	3

Course Objectives:

1. To familiarize the students with the use of a Project Management techniques and tools used in various industry sectors for achieving success in projects.
2. To understand and be able to apply processes and techniques throughout the life cycle of a project from initiation to closure.
3. To familiarize students to design a project proposal and build project teams.
4. To understand the role of project management office.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Understand the term project, project manager and the importance of Project management.
2. Analyse and initiate projects based on numeric and non-numeric criteria.
3. Analyze the effect of different organizational structures on the execution of projects. Perform Project estimation and budgeting.
4. Perform project planning activities including risk planning, scheduling, team building and resource allocation.
5. Perform project control activities like monitoring & control, auditing, reporting, tracking, risk mitigation & control.
6. Perform proper closure of different types of projects. Apply the techniques learned in the course in the execution of real-life projects.

Module No	Contents	Hrs. (30)	CO
1.	Project Management Fundamentals: Definition of a project, Necessity of project management, Triple constraints, Project life cycles, Project phases, Qualities of project manager, Role of project manager. Leadership and Ethics, Project management in various organization structures.	03	CO1
2.	Project Initiation: How to get a project started? Selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process and Project sponsor and creating charter; Project	05	CO2



	proposal. Effective project team, Stages of team development & growth, Conflicts and Negotiations.		
3.	Project Budgeting and Estimation: Project Plan, Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination, Project cost estimation and budgeting, Top down and bottoms up budgeting. Work element costing	06	CO3
4.	Project Planning and Management: Project Scheduling, GANTT Chart, Networking and Scheduling techniques. PERT and CPM. Crashing project time, Resource loading and levelling, Goldratt's critical chain, Project Stakeholders and Communication plan. Risk Management in projects: Risk management planning, Risk identification and risk register. Qualitative and quantitative risk assessment, Project procurement management. Change Management	05	CO4
5.	Project Monitoring and Control: Planning monitoring and controlling cycle. Information needs and reporting, engaging with all stakeholders of the projects. Team management, communication and project meetings. Earned Value management techniques for measuring value of work completed. Using milestones for measurement change requests and scope creep. Project audits.	05	CO5
6.	Project Closure: Customer acceptance. Reasons of project termination, Various types of project terminations, Process of project termination. Completing a final report, doing a lessons learned analysis, acknowledging successes and failures. Project management templates and other resources. Case studies of successful and failed projects.	06	CO6

Text Books:

1. Jack Meredith & Samuel Mantel, "Project Management: A managerial approach", WileyIndia, 10th Ed.
2. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 6th ed., Project Management Institute PA, USA.

Reference Books:

1. Harold Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", 12th Ed, Wiley.
2. S. S. Khanka, C. B. Gupta CB, "Entrepreneurship and Small Business Management" Sultan Chand & Sons, 2023.
3. Vasant Desai, "Entrepreneurship: Development and Management", Himalaya Publishing House, 2015

Subject Code	Subject Name	Teaching Scheme (Contact Hours 60)			Credits Assigned	
		Theory	Practical	Tutorial	Practical	Total
SY-BCA-S4-27	Python Programming	3	-	-	3	3

Course Objectives: The course will help the students to get familiar with:

1. Basics of Python programming
2. Data Structures and Functions in Python
3. Object Oriented Programming using Python
4. Files Handling in Python

Course Outcomes:

On successful completion of course, learner/student will be able to

CO1: Explain the basic concepts of Python Programming.

CO2: Demonstrate proficiency in the handling of loops and creation of functions.

CO3: Identify the methods to create and manipulate lists, tuples and dictionaries.

CO4: Discover the commonly used operations involving file handling.

CO5: Interpret the concepts of Object-Oriented Programming as used in Python

CO6: Develop the emerging applications of relevant fields using Python.

Module No	Contents	Hrs. (60)	CO
1.	Python Basics: Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples.	3	CO1
2.	Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions. Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions.	7	CO2
3.	Lists: Creating Lists; Operations on Lists; Built-in Functions on Lists; Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in	7	CO3

	Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries. Tuples and Sets: Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods		
4.	File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.	3	CO4
5.	Object Oriented Programming: Creating a Class, Self-Variables, Constructors, Types of Methods, Constructors in Inheritance, Polymorphism, The super () Method, Method Resolution Order (MRO), Operator Overloading, Method Overloading & Overriding, Interfaces in Python. Exceptions Handling: Exceptions, Exception Handling, Types of Exceptions, The Except Block, The assert Statement, User Defined Exceptions	4	CO5
6.	GUI Programming with Database Connectivity: GUI Programming Toolkits, Creating GUI Widgets with Tkinter, Creating Layouts, Form Components, Dialog Boxes. Types of Databases Used with Python, Mysql database Connectivity with Python, Performing DML operations on database	6	CO6

Text Books:

1. James Payne, "Beginning Python: Using Python 2.6 and Python 3.1", Wrox Publication
2. Dr. R. Nageswara Rao, "Core Python Programming", Dreamtech Press, Wiley Publication
3. Magnus Lie Hetland, "Beginning Python From Novice to Professional", Second Edition", Apress Publication

Reference Books:

1. Wesley J Chun, "Core Python Applications Programming" Third Edition, Pearson Publication.
2. E. Balguruswamy, "Introduction to Computing and Problem Solving using Python", McGraw Hill Publication
3. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Practical	Total
SY-BCA-S4-28	Impression Management	2	-	-	2	2

Course Objectives:

1. To understand the importance of interpersonal skills and emotional intelligence in personal and professional contexts.
2. To explore various strategies and techniques of impression management for effective communication and interaction.
3. To analyze the factors influencing impression management and their implications on behavior and perception.
4. To examine the role of impression management in personal relationships and professional settings.
5. To develop practical skills in applying impression management techniques in real-life situations.
6. To critically evaluate ethical considerations related to impression management and personal branding.

Course Outcomes: On successful completion of course, learner/student will be able to

1. Students will demonstrate an understanding of interpersonal skills, emotional intelligence, and their relevance in diverse contexts.
2. Students will be able to apply various strategies of impression management effectively in personal and professional interactions.
3. Students will analyze the influence of individual, situational, cultural, and organizational factors on impression management.
4. Students will develop proficiency in managing impressions in personal relationships and professional settings.
5. Students will apply impression management techniques to enhance their personal branding and career advancement prospects.
6. Students will critically evaluate ethical dilemmas related to impression management and make informed decisions.



Module No	Contents	Hrs. (30)	CO
1.	Introduction to Interpersonal Skills - Understanding Interpersonal Skills: Importance and Application in Personal and Professional Life - Daniel Goleman's Framework of Emotional Intelligence: Self-awareness, Self-regulation, Empathy, Social Skills - Maslow's Theory of Motivation: Hierarchy of Needs and its Implications on Behavior and Interaction - Effective Time Management Techniques: Prioritization, Goal Setting, Delegation, and Procrastination Management - Leadership Skills: Qualities of Effective Leaders, Leadership styles	6	CO1
2.	Strategies and Techniques of Impression Management - Self-Presentation Strategies: Self-Enhancement, Ingratiation, Intimidation, Exemplification, Supplication - Nonverbal Communication: Body Language, Facial Expressions, Proxemics, Clothing - Verbal Communication: Speech Patterns, Tone, Vocabulary, Conversational Techniques - Online Impression Management: Social Media, Personal Branding, Digital Footprint	5	CO2
3.	Factors Influencing Impression Management - Individual Factors: Personality Traits, Self-esteem, Self-monitoring - Situational Factors: Context, Audience, Goals - Cultural Factors: Cultural Norms, Values, Expectations - Organizational Factors: Organizational Culture, Leadership Style, Workplace Environment	3	CO3
4.	Impression Management in Personal Relationships - Relationship Formation: Initial Impressions, Attraction, Similarity - Relationship Maintenance: Self-Disclosure, Trust-building, Conflict Management - Relationship Dissolution: Impression Repair, Face-saving Strategies, Post-relationship Impression Management	3	CO4
5.	Impression Management in Professional Contexts Job Interviews: Resume Preparation, Presentation, Authenticity	7	CO5



	• Workplace Communication: Leadership, Teamwork, Conflict Resolution • Career Advancement: Networking, Performance Appraisals, Personal Branding • Ethics in Professional Impression Management: Authenticity vs. Manipulation, Integrity, Reputation Management		
6.	Psychological Perspectives on Impression Management • Self-concept and Identity: Self-verification, Self-esteem Maintenance • Cognitive Dissonance: Strategies to Reduce Dissonance through Impression Management • Social Influence: Conformity, Compliance, Obedience, and their Role in Impression Management • Emotional Intelligence: Regulation of Emotions, Emotional Expression, and Impression Management	6	CO6

Reference Books:

1. Goleman, D. (1995). Emotional Intelligence: Why It Can Matter More Than IQ.
2. Maslow, A. H. (1943). A Theory of Human Motivation.
3. Schlenker, B. R. (1980). Impression Management: The Self-Concept, Social Identity, and Interpersonal Relations.
4. Leary, M. R., & Kowalski, R. M. (1990). Impression management: A literature review and two-component model.



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Semester V

Syllabus

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
TY-BCA-S5-29	Software Engineering	4	-	-	4	4

Course Objectives:

1. To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
2. To explain methods of capturing, specifying, visualizing and analyzing software requirements.
3. To develop Awareness of the estimating software attributes that can directly or indirectly characterize software product
4. To describe design objective at each design level

Course Outcomes:

On successful completion of course, learner/student will be able to:

1. Understand the principles and practices of software engineering.
2. Apply software engineering processes and methodologies to develop software systems.
3. Perform requirements analysis and software design.
4. Implement software using appropriate programming languages and development tools.
5. Apply software testing and quality assurance techniques.
6. Use modern tools for software engineering.

Module No	Contents	Hrs. (45)	CO
1.	Overview of System Analysis and Design: Basic System Development Life Cycle, Different approaches, and models for System Development: Waterfall, Prototyping, Spiral (including WIN-WIN Spiral), Role & Skills of system Analyst	8	CO1
2.	Defining Requirement Specifications Software Requirements Specification Techniques, Fact finding methods Requirements Specifications, Software requirement Specification (SRS), requirements definition, IEEE standard SRS format.	7	CO2
3.	Requirement Analysis Information requirement Analysis – Decision Analysis Tools- Decision Tree, Decision Table, Structured English Functional Decomposition Diagram,	7	CO3



	Process modelling with Data Flow Diagrams, Entity Relationship Diagram: Identify Entity & Relationships Data dictionary		
4.	Input, Output and Program Design: Designing of Input, Output and Program: Design of input & Control: Objectives of Input Design, Data Capture Guidelines, Design of Source Document, Input Validations. Design of output: Objectives of Output, Design Types of Output User Interface design	8	CO4
5.	Maintenance: Types of Maintenance and maintenance cost, Introduction to legacy systems, Reverse Engineering, Role of documentation in maintenance and types of documentation, Introduction to Software testing, Types of Testing	6	CO5
6.	Software Metrics and Emerging Practices Software metrics and measurement, Software documentation and knowledge management, Emerging practices in software engineering: DevOps, etc.	6	CO6

Text Books:

1. Roger S Pressman “Software Engineering : A Practitioner’s Approach” 8th Edition Mcgraw-Hill
2. Ali Behforooz, Frederick J. Hudson, “Software Engineering Fundamentals” Oxford University Press.

Reference Books:

1. Jack T. Marchewka, “Information Technology Project Management” 4th Edition, Wiley India
2. “Software Engineering: A Precise Approach” Pankaj Jalote, Wiley India
3. Ian Sommerville “Software Engineering” 9th edition Pearson Education SBN-13: 978-0-13-703515-1, ISBN-10: 0-13-703515-2

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)				Credits Assigned	
		Theory		Practical	Tutorial	Theory	Total
TY-BCA-S5-30	Design and Analysis of Algorithms	4	-	-	-	4	4

Course Objectives:

1. To understand and apply the algorithm analysis techniques.
2. To design efficient algorithms for solving various computational problems using different design paradigms like divide-and-conquer, greedy approach, and dynamic programming.
3. To apply the learned concepts of algorithm design and analysis to solve real-world computational problems.
4. To understand typical methods to solve problems that are not solvable using traditional techniques.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Analyze the time and space complexity of algorithms using mathematical techniques such as asymptotic notation.
2. Implement the divide-and-conquer technique proficiently to address a variety of computational problems, effectively breaking them down into smaller, manageable subproblems.
3. Apply the greedy programming technique skillfully to solve algorithmic problems, making optimal choices at each step to achieve the best possible solution.
4. Apply the dynamic programming technique effectively to solve complex computational problems, optimizing solutions by storing and reusing intermediate results.
5. Develop strong problem-solving skills by tackling a variety of combinatorial problems using backtracking, both theoretically and through practical implementation.
6. Demonstrate proficiency in comprehending advanced concepts in the analysis of algorithms.

Module No	Contents	Hrs. (45)	CO
1.	Introduction to Algorithms Overview of algorithms and their importance, Basic algorithm analysis: asymptotic notation (Big O, Omega, Theta), Time and space complexity analysis, Analyzing loops and recursive algorithms.	4	CO1
2.	Divide and Conquer Principles of divide and conquer, Fundamentals of Divide and Conquer approach using Binary search, sequential search, Quick sort, and Merge sort and analyzing their complexity using the master theorem. Strassen's matrix multiplication, Closest pair of points.	9	CO2
3.	Greedy Technique Introduction, principles of greedy choice, Understanding limitations of greedy approaches. Prim's algorithm and Kruskal's Algorithm, fractional Knapsack problem, Job sequencing with deadlines, Huffman Trees.	9	CO3
4.	Dynamic programming Introduction, principles of Dynamic programming – Overlapping subproblems, Optimal substructure, Memoization Technique, 0/1 Knapsack Problem, Longest Common Subsequence.	9	CO4
5.	Backtracking Introduction, principles of backtracking, N-Queens problem, Sudoku solver, Subset sum problem	9	CO5
6.	Advanced Concepts Introduction to complexity theory: P vs. NP problems, Randomized algorithms and analysis, Approximation algorithms.	5	CO6

Text Books:

1. Anany Levitin, —Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2. Donald E. Knuth, "The Art of Computer Programming", Volumes 1 & 3 Pearson Education, 2009.
3. Harsh Bhasin, —Algorithms Design and Analysis, Oxford university press, 2016.
4. S. Sridhar, —Design and Analysis of Algorithms, Oxford university press, 2014.



Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
TY-BCA-S5-40	E-commerce	3	-	-	3	3

Course Objectives:

1. Understand the fundamental concepts of ecommerce.
2. Understand the importance of user experience (UX) and usability in ecommerce.
3. Understand the role of payment gateways in facilitating online transactions.
4. Understand search engine optimization (SEO), social media marketing, and analytics

Course Outcomes: On successful completion of course, learner/student will be able to

1. Understand the historical development and significance of ecommerce.
2. Understand practical experience in using ecommerce platforms and CMS for website development.
3. Understand the function and importance of payment gateways in processing online payments securely.
4. Understand SEO techniques to improve the visibility and ranking of ecommerce websites in search engine results.
5. Understand the end-to-end order management and fulfilment process in ecommerce.
6. Understand security measures and legal compliance requirements, including data protection, privacy, and consumer rights.



Module No	Contents	Hrs. (30)	CO
1.	Introduction to ecommerce Historical development and significance of ecommerce Different types of ecommerce models, such as B2C, B2B, and C2C Benefits and challenges of conducting business online Popular ecommerce platforms and technologies.	05	CO1
2.	Ecommerce Website Development Principles of effective ecommerce website design Importance of user experience (UX) and usability in ecommerce Navigation and site structure for ecommerce websites. Proficiency in using ecommerce platforms and content management systems (CMS) for website development.	05	CO2
3.	Ecommerce Payment Systems Payment methods commonly used in ecommerce, including credit cards, digital wallets, and bank transfers. Function and importance of payment gateways in processing online payments securely. Security best practices and compliance standards for ecommerce payment systems. Integrate payment gateways into ecommerce websites	05	CO3
4.	Ecommerce Marketing and Analytics Ecommerce marketing channels and strategies. Search engine optimization (SEO) for ecommerce websites Social media marketing techniques for promoting ecommerce businesses Analytics tools to measure and analyze ecommerce website performance.	05	CO4
5.	Ecommerce Logistics and Fulfillment Management and fulfilment process in ecommerce. Inventory management and control in ecommerce. Shipping and delivery options available for ecommerce	05	CO5
6.	Ecommerce Security and Legal Compliance Security threats and vulnerabilities in ecommerce. Data protection and privacy for ecommerce businesses. Legal compliance requirements, such as GDPR and PCI DSS for ecommerce websites	05	CO6

Text Books:

1. Kenneth C. Laudon and Carol Guercio Traver, "E-commerce 2020: Business, Technology, Society" Publication Year: 2020, ISBN-13: 978-0135111088.
2. Efraim Turban, Judy Strauss, Linda Lai, and James Wong, "Electronic Commerce 2021: A Managerial and Social Networks Perspective", Publication Year: 2020, ISBN-13: 978-0136036311.



3. Janice Reynolds, "The Complete E-Commerce Book: Design, Build & Maintain a Successful Web-based Business" , Publication Year: 2014, ISBN-13: 978-0764548571.

Reference Books:

1. Ryan Deiss and Russ Henneberry, "Digital Marketing For Dummies", 2021, ISBN-13: 978-1119235590.
2. Tanner Larsson, ” Ecommerce Evolved: The Essential Playbook To Build, Grow & Scale A Successful Ecommerce Business”, 2016, ISBN-13: 978-1534619347.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
TY-BCA-S5-41	Multimedia Applications	3	-	-	3	3

Course Objectives:

1. To provide students with a basic understanding of multimedia systems and its components.
2. This course focuses on topics in multimedia information representation and multimedia standards in the components of multimedia – text, audio, image, video and animation.
3. To provide information about the standards tools and techniques used in development of multimedia components for productions.
4. To create simple multimedia applications and products for using standalone, networked or web based computers.

Course Outcomes:

On successful completion of course, learner/student will be able to:

1. Develop understanding of technical aspect of multimedia systems.
2. Understand and explain the storage mechanism and applicability of various file formats for audio, and text media.
3. Understand and explain the storage mechanism and applicability of various file formats for video
4. Develop various multimedia systems applicable in real time.
5. Create a multimedia component using various tools and techniques.
6. Apply the guidelines and standards of multimedia systems and to analyze the performance of multimedia system.

Module No	Contents	Hrs. (30)	CO
1.	Introduction to multimedia, needs and areas of use, development platforms for multimedia identifying multimedia elements text, images, sound, animation and video, making simple multimedia with PowerPoint. Concepts of plain & formatted text, RTF& HTML texts, using common text preparation tools, conversion to and from of various text formats, using standard software, object linking and embedding concept.	5	CO1
2.	Sound - sound and its attributes, sound and its effects in multimedia, frequency, sound depth, channels and its effects on quality and storage, size estimation of space of a sound file, sound card standard – FM synthesis cards, waves table cards, MIDI and MP3 Files and Devices, 3D Sounds, recording and editing sound using sound editors like audacity, sound forge etc.	5	CO2



3.	Importance of images graphics in multimedia, vector and raster graphics, regular graphics vs. Interlaced graphics, image capturing methods - scanner, digital camera etc. Color models-RGB, CYMK, HUE, Saturation, and Brightness, Various Attributes of Images Size, Color, Depth etc, Various Image File Format BMP, DIB, CIF, PIC, and TIF format their features and limitations, image format conversion, various effects on images. create images using Photoshop, CorelDraw and apply various effects, using layers, channels and masks in images.	5	CO3
4.	Video- Basic of Video, Analog and Digital Video Type of Video, Digitization of Analog Video, Video Standard – NTSC, PAL, HDTV, Video Capturing Media /Instruments Videodisk Camcorder Compression Techniques, File Formats AVI, JPG, MPEG, Video Editing and Movie Making Tools, Converting Formats of Videos, Recording and Editing Videos Using Video Editing Software Like Adobe Premiere or Sony Vegas.	5	CO4
5.	Animation and its basic – principals of animation and its use in multimedia, computer system configuration and peripherals requirements, software for animation, effects of resolution, pixel depth, image size, on quality and storage, types of animation and applications. Authoring tools for multimedia – introduction to various types of multimedia authoring tools, CD/DVD based and web based tools, features and limitations, creating multimedia package using all components.	5	CO5
6.	Introduction to virtual reality and its applications, virtual reality terminology head mounts display (HMD), boom, cave, input devices and sensual technology, characteristic immersive vs. shared, augmented and mixed reality.	5	CO6

Text Books:

1. Ramesh Bangia-Introduction to Multimedia- Laxmi Publications Pvt. Ltd.
2. Tay Vaughan-Multimedia: Making It Work,TataMc-Graw Hill.

Reference Books:

1. Bhatnager G. Elsevie-,Introduction to Multimedia Systems,
2. Satish Jain O Level Introduction to Multimedia (M4.2-R4), BPB Publications.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
TY-BCA-S5-42	Cloud Computing	3	-	-	3	3

Course Objectives:

1. Learn the fundamentals of cloud computing and virtualization techniques.
2. Provide insights into the cloud infrastructure and available cloud service providers.
3. Understand the cloud programming and software environment to access the need of security with related remedial measures to deal with the threats.
4. Explore the trends in cloud computing and its related fields.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Understand the key fundamentals of cloud computing.
2. Understand the key concepts of virtualization and its enabling technologies.
3. Analyze the cloud architectural stack and various cloud platforms.
4. Explore the cloud programming models and associated software environments.
5. Examine the cloud security architecture and apply techniques to mitigate the threats.
6. Explore cloud computing to solve real world use cases and future trends.

Module No	Contents	Hrs. (45)	CO
1.	Introduction: Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models, Benefits and disadvantages of cloud systems, Assessing the Value Proposition, Measuring the Cloud's Value, Capital Expenditures, Total Cost of Ownership, Service Level Agreements, Licensing Models. Federated Cloud/Intercloud, Types of Clouds.	5	CO1
2.	Virtualization and Cloud enabling Technologies: Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation. Data centers, Web technology, Dockers and Containers	8	CO2
3.	Cloud Infrastructure and Platforms: Cloud Computing Stack, Composability, Infrastructure, Platforms and Virtual Appliances, Communication Protocols and Applications, Connecting to the Cloud, Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS) Amazon web services: Compute services Storage Services Communication Services Additional services	9	CO3

	Google AppEngine: Architecture and core concepts, Application life cycle, Cost model Microsoft Azure: Azure core concepts, SQL Azure, Windows Azure platform appliance		
4.	Cloud programming and Software Environments: GFS and HDFS, BigTable, HBase and Dynamo Cloud data stores: Datastore and SimpleDB, Cloud Storage-Overview, Cloud Storage Providers. Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP), Syndication (Atom, Atom Publishing Protocol, and RSS), Standards for Security.	9	CO4
5.	Cloud Access and Security: Cloud Security Challenges, Software-as-a-Service Security, End-User Access to Cloud Computing Overview, Identity Protocol Standards, Windows Azure Identity Standards. General Security Advantages of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery. Disaster Recovery- Understanding the Threats.	8	CO5
6.	Emerging Trends and Future Direction with Use cases: Serverless Computing, Edge Computing, Quantum Computing and its impact on cloud services, Ethical considerations in cloud deployment and usage. Case studies with real life scenarios in the domain of health care, security, finance, manufacturing, industrial IoT etc.	6	CO6

Text Books:

1. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN :978 9332535923, 9332535922, 1 st Edition
2. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", 2010, The McGraw-Hill.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw Hill, ISBN: 978 1259029950, 1259029956.
2. John W. Rittinghouse and James F. Ransome (2010), "Cloud Computing, Implementation, Management, and Security", CRC Press.
3. Borko Furht, Armando Escalante (2010), "Handbook of Cloud Computing", Springer.
4. Michael Kavis, (2014) "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, AND IaaS)", John Wiley & Sons.
5. Sunil kumar Manvi, Gopal K. Shyam (2021) "Cloud Computing: Concepts and Technologies", CRC Press, 1st edition.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
TY-BCA-S5-43	Digital Marketing	3	-	-	3	3

Course Objectives:

1. The aim is to give knowledge about using digital marketing in and as business.
2. To make SWOT analysis, SEO optimization and use of various digital marketing tools.
3. To aware Web Design, different web sites for increasing sales.
4. Establish brand as a trusted authority in industry through Social media content and interactions.

Course Outcomes:

1. Understand E Marketing, Search Engine Optimization
2. To Understand Digital Marketing and its channels
3. Understand to create marketing plan and use of web sites
4. Understand Search Engine Optimization
5. Understand various modes and means of social media marketing.
6. To get information about Digital Marketing Tools

Module No	Contents	Hrs. (26)	CO
1.	E-Marketing : Introduction- Understanding Internet Marketing, Search Engine Optimization Search Engine Marketing, Email Marketing, Digital Display Marketing	4	CO1
2.	Introduction to New Age Media (Digital) Marketing : What is Digital Marketing, Digital vs. Real Marketing, Digital Marketing Channels, Types of Digital Marketing (Overview)-Internet Marketing, Social Media Marketing, Mobile Marketing	5	CO2
3.	Creating Initial Digital Marketing Plan Content management, SWOT analysis: Strengths, Weaknesses, Opportunities, and Threats, Target group analysis	4	CO3
4.	Marketing using Web Sites Web design, Optimization of Web sites, MS Expression Web	4	CO4
5.	Search Engine Optimization SEO Optimization Writing the SEO content	4	CO5
6.	Social Media Marketing	09	CO6



	Understanding Social Media Marketing, Social Networking (Facebook, LinkedIn, Twitter, etc.), social media (Blogging, Video Sharing - YouTube, Photo sharing – Instagram, Podcasts) Modes of Social Media Marketing - Creating a Facebook page Visual identity of a Facebook page, Types of publications, Facebook Ads, Creating Facebook Ads, Ads Visibility Business opportunities and Instagram options Optimization of Instagram profiles, Integrating Instagram with a Web Site, and other social networks, keeping up with posts Business tools on LinkedIn Creating campaigns on LinkedIn, Analyzing visitation on LinkedIn Creating business accounts on YouTube, YouTube Advertising, YouTube Analytics, E-mail marketing E-mail marketing plan, E-mail marketing campaign analysis, Keeping up with conversions, Digital Marketing tools: Google Ads, Facebook Ads, Google Analytic, Zapier, Google Keyword Planner		
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Text Books:

1. Digital Marketing for Dummies by Ryan Deiss and Russ Hennesberry
2. Digital Marketing All-In-One Bundle, 2 in 1 Bundle, Savanna Payne · Wendell Yanick

Reference Books:

1. Fundamentals of Digital Marketing Second Edition by Puneet Bhatia, Pearson
2. The social media Bible: Tactics, Tools, & Strategies for Business Success by Lon Safko
3. Web Analytics 2.0 – Avinash Kaushik



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Semester VI Syllabus

Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
TY-BCA-S6-44	Artificial Intelligence	4	-	-	4	4

The student would be able to:

1. Understand the fundamentals of artificial intelligence (AI) and its various subfields.
2. Explore different AI techniques such as knowledge representation, reasoning, and problem-solving.
3. Gain proficiency in machine learning algorithms and their applications in AI.
4. Learn about natural language processing (NLP) and its significance in AI systems.
5. Understand the principles of computer vision and its role in AI applications.
6. Apply ethical considerations and societal impacts of AI technologies.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Demonstrate a comprehensive understanding of artificial intelligence principles, methodologies, and applications.
2. Ability to apply various AI techniques for problem-solving and decision-making.
3. Proficiency in implementing machine learning algorithms and evaluating their performance.
4. Apply natural language processing techniques to analyze and generate human language.
5. Understand the principles of computer vision and develop AI systems for image understanding and processing.
6. Evaluate ethical considerations and societal impacts associated with the development and deployment of AI technologies.

Module No	Contents	Hrs. (45)	CO
1.	Introduction to Artificial Intelligence: Definition of AI, history, and evolution of AI, intelligent agents, problem-solving methods (search algorithms, heuristic search), knowledge representation and reasoning.	6	CO1
2.	Machine Learning Fundamentals: Introduction to machine learning, supervised learning, unsupervised learning, reinforcement learning, neural networks, deep learning	9	CO2
3.	Natural Language Processing (NLP): Basics of natural language processing, syntactic and semantic analysis, text classification, information extraction, sentiment analysis, machine translation.	9	CO3



4.	Computer Vision and Image Processing: Introduction to computer vision, image representation, feature extraction, object detection, image classification, convolutional neural networks (CNNs).	8	CO4
5.	Ethical and Societal Implications of AI : Ethical frameworks in AI, bias and fairness, privacy concerns, societal impacts, responsible AI development.	8	CO5
6.	AI Applications and Case Studies : Real-world applications of AI in various domains such as healthcare, finance, robotics, and autonomous vehicles. Case studies and project presentations..	5	CO6

Text Books:

1. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig.
2. "Pattern Recognition and Machine Learning" by Christopher M. Bishop.
3. "Natural Language Processing with Python" by Steven Bird, Ewan Klein, and Edward Loper.

Reference Books:

1. "Artificial Intelligence: Structures and Strategies for Complex Problem Solving" by George F. Luger.
2. "Computer Vision: Algorithms and Applications" by Richard Szeliski.
3. "Artificial Unintelligence: How Computers Misunderstand the World" by Meredith Broussard.



Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
TY-BCA-S6-45	Machine Learning	4	-	-	4	4

Course Objectives:

The student would be able to:

1. Understand the fundamentals of machine learning algorithms and their applications.
2. Develop proficiency in data preprocessing techniques, feature selection, and dimensionality reduction.
3. Gain practical experience in model selection, evaluation, and hyperparameter tuning.
4. Explore advanced topics such as deep learning, reinforcement learning, and unsupervised learning.
5. Acquire skills in implementing machine learning algorithms using popular libraries such as TensorFlow and scikit-learn.
6. Apply machine learning techniques to real-world problems and datasets.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Demonstrate a solid understanding of various machine learning algorithms and their suitability for different tasks.
2. Ability to preprocess raw data effectively, including handling missing values, scaling features, and encoding categorical variables.
3. Evaluate machine learning models using appropriate metrics and techniques, and interpret their performance.
4. Implement machine learning algorithms and techniques in Python using libraries like TensorFlow and scikit-learn.
5. Explore and apply advanced machine learning concepts such as neural networks, reinforcement learning, and clustering.
6. Successfully tackle real-world problems by designing, training, and evaluating machine learning models on relevant datasets.

Module No	Contents	Hrs. (45)	CO
1.	Introduction: Overview of machine learning, types of machine learning, supervised and unsupervised learning, applications.	6	CO1
2.	Data Preprocessing and Feature Engineering: Data cleaning, feature scaling, handling missing values, feature selection, dimensionality reduction.	9	CO2
3.	Model Selection and Evaluation: Cross-validation, performance metrics, model selection techniques, hyperparameter tuning.	9	CO3
4.	Advanced Machine Learning Techniques: Deep learning fundamentals, neural networks, convolutional neural networks (CNNs), recurrent neural networks (RNNs), reinforcement learning.	8	CO4
5.	Implementing Machine Learning Algorithms : Introduction to TensorFlow, building and training models with TensorFlow, scikit-learn for traditional ML algorithms.	8	CO5
6.	Machine Learning Applications : Real-world case studies, applying machine learning to domains such as healthcare, finance, and marketing.	5	CO6

Text Books:

1. "Introduction to Machine Learning with Python" by Andreas C. Müller & Sarah Guido.
2. "Feature Engineering for Machine Learning" by Alice Zheng & Amanda Casari.
3. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron.

Reference Books:

1. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.
2. "Building Machine Learning Powered Applications" by Emmanuel Ameisen.
3. "Scikit-Learn Cookbook" by Trent Hauck.

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
TY-BCA-S6-46	Internet of Things	3	-	-	3	3

Course Objectives: (4 Objectives)

1. To understand the architectural overview of IoT.
2. To understand various Sensors and Smart things in IoT.
3. Conceptualization of different network protocols and communication technologies.
4. Apply the concepts of IoT to develop applications

Course Outcomes: (6 Outcomes)

On successful completion of course, learner/student will be able to

1. Interpret the technical building blocks of IoT.
2. Demonstrate various things to build IoT.
3. Classify various IoT protocols.
4. Explain communication technologies.
5. Apply Data Analytics tools for IoT
6. Apply concepts of IoT to design real world applications.

Module No	Contents	Hrs. (30)	CO
1.	Introduction to Internet of Things (IoT): Definition and characteristics of IoT, Technical Building blocks of IoT, Device, Communication Technologies, Data, Physical design of IoT, IoT enabling technologies, IoT Issues and Challenges- Planning, Costs and Quality ,Security and Privacy, Risks.	05	CO1
2.	Things in IoT: Sensors/Transducers – Definition, Principles, Classifications, Types, Characteristics and Specifications, Actuators - Definition, Principles, Classifications, Types, Characteristics and Specifications Smart Object – Definition, Characteristics and Trends, Introduction of Embedded Systems	05	CO2
3.	IoT Protocols: Connecting Smart Objects : Communications Criteria, IoT Access Technologies, IEEE 802.15.4, IEEE 802.15.4g and 802.15.4e, LoRaWAN, MQTT, CoAP, XMPP and AMQT, IoT communication models	05	CO3
4.	IoT Communication technologies: Bluetooth, BLE, Zigbee, NFC, RFID, Wi-Fi, Interfacing of wifi, RFID, Zigbee, NFC with development board. IoT and cloud integration, Application development and cloud processing	05	CO4



5.	Data and Analytics for IoT: Introduction to Data Analytics for IoT, Structured and Unstructured Data, IoT Data analytics Challenges, Data Visualization Techniques	04	CO5
6.	Applications of IoT: Home Automation – Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors. Smart Cities – Smart Parking, Smart Lighting, Smart Roads, Structural Health Monitoring, Surveillance Smart Environment – Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection Smart Business – Inventory Management, Smart Payments, Smart Vending Machines Smart Agriculture – Smart Irrigation, Green House Control Smart Health & Lifestyle – Health & Fitness Monitoring, Wearable Electronics	06	CO6

Text Books:

- David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, “IoT Fundamentals – Networking Technologies, Protocols, and Use Cases for the Internet of Things”, 1st Edition, Published by Pearson Education, Inc, publishing as Cisco Press, 2017.
- Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2020.
- Anand Tamboli, “Build Your Own IoT Platform”, 1st Edition, Apress, 2019.

Reference Books:

- Hakima Chaouchi, “The Internet of Things - Connecting Objects to the Web”, 1st Edition, Wiley, 2010
- Perry Lea, “Internet of things For Architects”, 1st Edition, Packt Publication, 2018

Subject Code	Subject Name	Teaching Scheme (Contact Hours 30)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
TY-BCA-S6-47	Image Processing	2	-	-	2	2

Course Objectives:

The student would be able to:

1. Understand the fundamentals of digital image processing and its applications.
2. Learn various techniques for image enhancement and restoration.
3. Explore methods for image segmentation and feature extraction.
4. Gain proficiency in image transformation and geometric operations.
5. Acquire skills in image compression and understanding of its principles.
6. Apply image processing algorithms to solve real-world problems in fields like medical imaging, remote sensing, and multimedia.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Demonstrate a solid understanding of digital image representation and basic processing techniques.
2. Ability to enhance images through techniques like histogram equalization, spatial filtering, and noise reduction.
3. Implement image segmentation algorithms to partition images into meaningful regions.
4. Apply feature extraction methods for object recognition and pattern analysis in images.
5. Proficiency in geometric transformations such as rotation, scaling, and translation.
6. Successfully compress images using techniques like JPEG and understand the trade-offs involved.

Module No	Contents	Hrs. (30)	CO
1.	Introduction to Digital Image Processing: Digital image fundamentals, image acquisition, representation, and visualization..	5	CO1
2.	Image Enhancement and Restoration: Spatial domain methods, frequency domain methods, image denoising, and sharpening.	5	CO2
3.	Image Segmentation and Feature Extraction: Thresholding techniques, region-based segmentation, edge detection, feature extraction methods.	5	CO3
4.	Image Transformation and Geometric Operations : Image transformations (rotation, scaling, translation), geometric operations (warping, morphing).	5	CO4
5.	Image Compression Techniques : Lossy and lossless compression, JPEG compression, wavelet-based compression.	5	CO5



6.	Applications of Image Processing : Medical imaging, remote sensing, multimedia applications, and emerging trends..	4	CO6
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Text Books:

1. "Digital Image Processing" by Rafael C. Gonzalez and Richard E. Woods.
2. "Digital Image Processing Using MATLAB" by Rafael C. Gonzalez, Richard E. Woods, and Steven L. Eddins.
3. "Image Processing, Analysis, and Machine Vision" by Milan Sonka, Vaclav Hlavac, and Roger Boyle.

Reference Books:

1. "Practical Applications in Digital Signal Processing" by Richard Newbold.
2. "Introduction to Data Compression" by Khalid Sayood.
3. "Computer Vision: Algorithms and Applications" by Richard Szeliski..



Subject Code	Subject Name	Teaching Scheme (Contact Hours 45)			Credits Assigned	
		Theory	Practical	Tutorial	Theory	Total
TY-BCA-S6-48	Big Data Analytics	3	-	-	3	3

Course Objectives:

1. To explore the underlying principles and characteristics of big data analytics, including volume, velocity, variety, and veracity.
2. To familiarize with the functionalities and applications of tools like Hadoop, NoSQL databases, and MapReduce for handling large-scale data processing tasks.
3. To learn various techniques for mining data streams and social network graphs, as well as big data mining algorithms
4. To Learn the utilization of big data in social networks and recommendation systems

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Understand the motivation behind big data systems and identify primary sources of big data in real-world contexts.
2. Utilize frameworks such as Hadoop and NoSQL to proficiently store, retrieve, and process large volumes of data for analytics.
3. Implement data-intensive tasks using the MapReduce paradigm to handle massive datasets efficiently.
4. Apply algorithms to analyze various types of big data, including streams.
5. Apply different algorithms for classifying, clustering, and identifying associations within big data sets.
6. Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications.



Module No	Contents	Hrs. (45)	CO
1.	Introduction Overview of Big Data Analytics: Definition, importance, and applications. Characteristics of Big Data: Volume, Velocity, Variety, Veracity, and Value (5Vs). Types of Big Data, Business Intelligence vs. Big Data, Big Data Challenges, Examples of Big Data in Real Life.	4	CO1
2.	Big Data Storage and Management Introduction to NoSQL Databases: Types (Document, Columnar, Key-Value, Graph), comparison with relational databases. NO SQL Database- Mongo DB: Introduction, Features, Data types, Mongo DB Query language, Create, Read Update and Delete(CRUD) operations, Projection, Limiting Records, Sorting Records, Arrays, Indexing, Aggregation, Replication, Sharding. Cassandra: Introduction, Features, Components, Data types, Collections Cassandra Query Language (CQL), CRUD operations, Keyspace, Cassandra Shell Commands.	9	CO2
3.	Big Data Processing Frameworks Hadoop: Introduction to Hadoop, Features, Advantages, Hadoop Core Components, Hadoop Ecosystem, CAP Theorem, BASE Concept. Analyzing big data with a Shared Nothing Map Reduce: Mapper, Reducer, Combiner, Partitioner, Details of MapReduce Execution, Coping with Node Failures, Job Scheduling, shuffle and sort, task execution , MapReduce types, input formats, output formats, Matrix Multiplication	9	CO3
4.	Mining Big Data Streams Stream Data Model – Sampling Data in the Stream – Filtering, Filtering Streams: The Bloom Filter, Counting Distinct Elements in a Stream: The Count-Distinct Problem, The Flajolet-Martin Algorithm, Estimating Moments. Counting Oneness in a Window: The Datar-Gionis-Indyk-Motwani Algorithm, Decaying Window	9	CO4
5.	Big Data Mining Algorithms Frequent Itemsets Memory Basic Algorithm of Park, Chen, and Yu. The SON Algorithm and MapReduce. Classification Algorithms: Parallel Decision trees, Overview SVM classifiers, Parallel SVM, KNearest Neighbor classifications for Big Data, One Nearest Neighbour.	8	CO5



	Clustering Algorithms: CURE Algorithm. Canopy Clustering, Clustering with MapReduce		
6.	Real-Time Big Data Models A Model for Recommendation Systems, Content- Based Recommendations, Collaborative Filtering. Social Networks as Graphs, Clustering of Social Network Graphs, Direct Discovery of Communities.	6	CO6

Text Books:

1. Anand Rajaraman and Jeff Ullman Mining of Massive Datasets, Cambridge University Press.
2. Alex Holmes Hadoop in Practice, Manning Press, Dreamtech Press..
3. Professional NoSQL Paperback, by Shashank Tiwari, Dreamtech Press
4. MongoDB: The Definitive Guide Paperback, Kristina Chodorow (Author), Michael Dirolf, O'Reilly Publications

Reference Books:

1. Tom White Hadoop: The Definitive Guide Third Edition, O'reilly Media, 2012.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGrawHill Publishing, 2012.
3. Bill Franks , Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics, Wiley.
4. Paul Zikopoulos, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill Education



Subject Code	Subject Name	Teaching Scheme (Contact Hours 120)			Credits Assigned	
		Theory	Practical	Tutorial	Practical	Total
TY-BCA-S6-49	Internship/ Major Project	-	4	-	4	4

Course Objectives:

1. To offer potential avenues for acquiring, comprehending, and refining the real-time technical and managerial skills essential for the job.
2. To familiarize students with the authentic industrial environment, which goes beyond the scope of classroom simulations, thereby cultivating competent professionals for the industry.
3. To provide exposure to the current technological developments relevant to the subject area of training.
4. To promote academic, professional and/or personal development.
5. To create conditions conducive to quest for knowledge and its applicability on the job.

Course Outcomes:

On successful completion of course, learner/student will be able to

1. Demonstrate proficiency in applying theoretical knowledge to real-world projects.
2. Develop skills in documenting and presenting technical work.
3. Enhance communication, teamwork, and time management skills.
4. Understand the architecture and functioning of complex systems within the industry context.
5. Exhibit enhanced problem-solving skills by addressing issues encountered during the internship.
6. Demonstrate integrity and responsibility in handling professional tasks.

Guidelines:

1. The candidate should submit a synopsis of the proposed work to be done during Internship programme/ Industrial Project/ Dissertation/ Industrial Dissertation. The synopsis received should be examined or evaluated by the departmental committee.
2. Intimation of commencement of internship shall be submitted to the HOD concerned before the commencement of the ongoing semester.
3. Two guides will supervise the internship project work, one from the department and another one from industry.
4. Industry/Educational Organization must submit the month-wise satisfactory attendance of the students to the department.
5. Candidate should regularly visit the institute and present his/her project progress report to their respective guide(s).



6. The final internship project presentation is evaluated on the basis of the recommendation given by outside supervisor, and further can be evaluated by institute guide.
7. Industry/ Institute should allow to produce results obtained during project/ internship period in the project report. The written certificate to this effect from the industry/ institute is mandatory before consideration of the proposed project/ internship.
8. After completion of internship, students are required to submit report of work done as per the template provided by the department, copy of internship certificate, feedback from employer/internship mentor, stipend proof (in case of paid internship).

Guidelines for Assessment of Project:

1. The Internship Evaluation Committee shall be constituted for assessing the progress of internship work. There will be 2 evaluations to assess the progress of internship work. The assessment will be based on formulation of project work, literature review, feasibility of solution, clearly stated requirements and specifications, design of proposed system, implementation details, validation of results.
2. Internship report should be prepared as per the guidelines given by the department.
3. In internal assessment, focus shall be on student's understanding, contribution and response to questions.
4. Students should report to internal mentor atleast twice in a month and present his/her project progress.
5. The internal marks are based on the performance of the students, review performances, quality of the report, Oral Presentation and regularity.

University Examination:

After successful completion of the internship work, the project will be assessed jointly by panel of Internal and External Examiners based on presentation and demonstration of the work.