

GURU KASHI UNIVERSITY



Bachelor of Computer Applications

Session: 2026-27

Faculty of Computing

Graduate Attributes of the Programme: -

Type of learning outcomes	The Learning Outcomes Descriptors
Graduates should be able to demonstrate the acquisition of:	
Learning outcomes that are specific to disciplinary/interdisciplinary areas of learning	Ability to design, develop, and implement software using modern programming languages and development tools.
	Proficiency in analyzing business problems and developing appropriate software solutions through methodologies like SDLC or Agile.
	Knowledge of computer networks, data communication, and cybersecurity to ensure secure and efficient systems.
	Ability to integrate computing principles with interdisciplinary fields such as business, healthcare, and education to create tailored solutions.
Generic learning outcomes	Strong problem-solving skills, applying logical reasoning and critical thinking to address complex issues.
	Effective communication skills for presenting technical information clearly in both written and oral formats.
	Ability to work well in diverse teams, contributing to achieving shared project goals.

Programme Learning outcomes: An Undergraduate Certificate is awarded to students who have demonstrated the achievement of the outcomes located at level 4.5:

Program Specific Outcomes	Element of the Descriptor	Programme learning outcomes relating to Undergraduate Certificate
The graduates should be able to demonstrate the acquisition of:		
PSO1	Knowledge and understanding	Develop foundational knowledge in programming, computer systems, and mathematics.
		Gain introductory knowledge in web technologies and management principles.
		Understand human values and professional ethics.
		Develop an awareness of the latest trends and emerging technologies
PSO2	General, technical and professional skills required to perform and accomplish tasks	Acquire practical skills in programming, computer operations, and system troubleshooting.
		Develop technical skills in assembling, troubleshooting, and basic internet-based applications.
		Demonstrate effective communication and collaboration skills to work efficiently in team environments and multidisciplinary projects.
PSO3	Application of knowledge and skills	Apply knowledge to solve computational problems and implement concepts in practical environments. Utilize web and technical skills to address basic business and IT-related scenarios.
PSO4	Generic learning outcomes	Strengthen problem-solving abilities, logical thinking, and analytical skills.

		Enhance communication and interpersonal skills.
PSO5	Constitutional, humanistic, ethical, and moral values	Learn the importance of ethical conduct and values in personal and professional spheres.
PSO6	Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	Develop entry-level technical and entrepreneurial skills applicable to IT and management roles.
PSO7	Credit requirements	A student will be allowed an exit option after passing first academic year of the BCA Programme with requisite 52 credits including the 4 credits of internship of 8 weeks duration as per scheme of the programme
PSO8	Entry requirements	Passed 10+2 or Equivalent with at least 45% in the aggregate. OR Those candidates who have passed their Matriculation examination and have also passed three-year Diploma in any Trade from Punjab State Board of Technical Education & Industrial Training, Chandigarh or such examination from any other recognized State Board of Technical Education, or Sant Longowal Institute of Engineering & Technology, Longowal.

Program Structure of the Bachelor of Computer Application

Semester 1st									
Course Code	Course Title	Type of Course							
			L	T	P	Credits	Int	Ext	Total Marks
BCA1100	Programming in C	Core	3	0	0	3	30	70	100
BCA1101	Computer Fundamentals	Core	3	0	0	3	30	70	100
BCA1102	Fundamentals of Math	Core	4	0	0	4	30	70	100
BCA1103	Programming in C Lab	Core	0	0	2	1	30	70	100
BCA1104	Computer Fundamentals Lab	Core	0	0	2	1	30	70	100
BCA1109	Creative Writing & Presentations	Skill Enhancement Course	0	0	6	3	30	70	100
BCA1106	PC Assembling and Trouble Shooting	Vocational Course	0	0	4	2	30	70	100
BCA1107	Principles and Practice of Management	Multidisciplinary Course	3	0	0	3	30	70	100
VAC0002	Human Values & Professional Ethics	Value Added Course	2	0	0	2	30	70	100
BCA1108	Communication Skills - I	Ability Enhancement Course	2	0	0	2	30	70	100
Total			17	0	14	24	300	700	1000

Semester 2nd									
Course Code	Course Title	Type of Course							
			L	T	P	Credits	Int	Ext	Total Marks
BCA2150	Programming Using C++	Core	3	0	0	3	30	70	100
BCA2151	Operating System	Core	3	0	0	3	30	70	100
BCA2152	Discrete Structures	Core	4	0	0	4	30	70	100
BCA2153	Programming using C++ Lab	Core	0	0	2	1	30	70	100
BCA2154	Operating System Lab	Core	0	0	2	1	30	70	100
BCA2159	Introduction to Web technologies	Vocational Course	2	0	0	2	30	70	100
BCA2160	Introduction to Web technologies Lab	Vocational Course	0	0	4	2	30	70	100
BCA2161	Minor Project based Learning	Skill Enhancement Course	0	0	6	3	30	70	100
BCA2157	Human Resource Management	Multidisciplinary	3	0	0	3	30	70	100
VAC0001	Environment Education	Value Added Course	2	0	0	2	30	70	100
BCA2158	Communication Skills – II	Ability Enhancement Course	2	0	0	2	30	70	100
Total			19	0	14	26	330	770	1100

Semester 3 rd									
Course Code	Course Title	Course Type							
			L	T	P	Credits	Int	Ext	Total Marks
BCA3200	Data Structures	Core	3	0	0	3	30	70	100
BCA3201	Relational Database Management System	Core	3	0	0	3	30	70	100
BCA3202	Digital Electronics	Core	4	0	0	4	30	70	100
BCA3203	Data Structure Lab	Core	0	0	2	1	30	70	100
BCA3204	Relational Database Management System Lab	Core	0	0	2	1	30	70	100
BCA3205	Multimedia and its Applications	Vocational Course	2	0	0	2	30	70	100
BCA3206	Multimedia and its Applications Lab	Vocational Course	0	0	4	2	30	70	100
BCA3207	Organizational Behavior	Multidisciplinary	3	0	0	3	30	70	100
BCA3209	- Soft Skills and Personality Development	Ability Enhancement Course	2	0	0	2	30	70	100
Discipline Elective- I (Any one of the following)									
BCA3217	Disaster Risk Reduction and Management: Skills for Safety and Resilience	Skill Enhancement Course	2	0	2	3	30	70	100
BCA3218	Basics of Cyber Security		3	0	0	3			
BCA3208	Network Administration		0	0	6	3			
Total			20	0	16	27	300	700	1000

Semester 4 th									
Course Code	Course Title	Course Type							
			L	T	P	Credits	Int	Ext	Total Marks
BCA4250	Programming using Java	Core	3	0	0	3	30	70	100
BCA4251	Programming using Python	Core	3	0	0	3	30	70	100
BCA4252	Software Engineering	Core	4	0	0	4	30	70	100
BCA4253	Programming using Java Lab	Core	0	0	2	1	30	70	100
BCA4254	Programming using Python Lab	Core	0	0	2	1	30	70	100
BCA4255	Minor Project	Vocational Course	0	0	8	4	30	70	100
IKS0006	Indian Health Sciences	Value Added Course	2	0	0	2	30	70	100
BCA4256	Acquiring Business Communication-ABC	Ability Enhancement Course	2	0	0	2	30	70	100
Discipline Elective- II (Any one of the following)									
BCA4257	Theory of Computation	Discipline Elective-I	4	0	0	4	30	70	100
BCA4258	Big Data								
BCA4259	Embedded Systems								
Total			18	0	12	24	270	630	900

Programme learning outcomes: The Bachelor's degree is awarded to students who have demonstrated the achievement of the outcomes located at level 5.5:

Program Specific Outcomes	Element of the Descriptor	Programme learning outcomes relating to Bachelor Degree
The graduates should be able to demonstrate the acquisition of:		
PSO1	Knowledge and understanding	A comprehensive understanding of computer science fundamentals, including programming, databases, and software development.
		Proficiency in core programming languages such as C, C++, Java, and Python for solving computational problems.
		Insight into advanced topics such as Artificial Intelligence, Machine Learning, Cloud Computing, and Data Science.
		Knowledge of web development, mobile application development, and multimedia technologies.
PSO2	General, technical and professional skills required to perform and accomplish tasks	The ability to design, implement, and test software applications for specific needs.
		Skills to manage and analyze large datasets using advanced tools and statistical methods.
		Expertise in debugging, troubleshooting, and optimizing code for performance improvements.
PSO3	Application of knowledge and skills	Apply theoretical knowledge to practical scenarios through projects, internships, and lab-based learning. Integrate multimedia and

		communication technologies into innovative IT solutions.
PSO4	Generic learning outcomes	Communicate effectively in both technical and non-technical environments using oral and written communication skills. Work collaboratively in diverse teams, demonstrating leadership and project management skills. Adapt to new technologies and continuously upgrade skills through self-directed learning.
PSO5	Constitutional, humanistic, ethical, and moral values	Display ethical responsibility in handling data, intellectual property, and technology. Contribute to society by designing solutions that promote inclusivity, sustainability, and accessibility.
PSO6	Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	Be industry-ready with job-specific skills in areas like software development, data analysis, networking, and cybersecurity. Acquire an innovative and problem-solving mindset to meet challenges in the IT industry.
PSO7	Credit requirements	144 Cr.

Semester 5th

Course Code	Course Title	Course Type							
			L	T	P	Cr.	Int	Ext	Total
BCA5300	Artificial Intelligence	Core	4	0	0	4	30	70	100
BCA5301	Computer Graphics	Core	4	0	0	4	30	70	100
BCA5302	Artificial Intelligence Lab	Core	0	0	4	2	30	70	100
BCA5303	Computer Graphics Lab	Core	0	0	4	2	30	70	100
IKS0002	Indian Education	Value Added Course	2	0	0	2	30	70	100
BCA5304	Internship	Skill Based	0	0	0	4	30	70	100
BCA5305	Basics of Android App development	Vocational Course	2	0	0	2	30	70	100
BCA5306	Basics of Android App development Lab	Vocational Course	0	0	4	2	30	70	100
BCA5307	Search Engine Optimization	MIN	2	0	0	2	30	70	100
Total			14	0	12	24	270	630	900

Semester 6 th									
Course Code	Course Title	Course Type							
			L	T	P	Cr.	Int	Ext	Total
BCA6350	Machine Learning	Core	3	0	0	3	30	70	100
BCA6351	Cloud Computing	Core	4	0	0	4	30	70	100
BCA6352	Information Security	Core	4	0	0	4	30	70	100
BCA6353	Machine Learning Lab	Core	0	0	2	1	30	70	100
BCA6354	Major Project	Technical Skill	0	0	8	4	30	70	100
BCA6355	Digital Marketing	Min	2	0	0	2	30	70	100
BCA6356	Media and digital communication	Ability Enhancement Course	2	0	0	2	30	70	100
Discipline Elective- III(Any one of the following)									
BCA6357	Internet of Things	Disciplinary Electives-II	4	0	0	4	30	70	100
BCA6358	Data Science								
BCA6359	Ethical Hacking								
Total			19	0	10	24	240	560	800
Grand Total			107	0	76	149	1710	3990	5700

Semester – I

Course Title: Programming in C	L	T	P	Cr.
Course Code: BCA1100	3	0	0	3

Total Hours: 45

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Develop confidence for self-education and ability for life-long learning needed for Computer language.
- CO2. Handle possible errors during program execution.
- CO3. Build logic used in Programming.
- CO4. Design and develop Computer programs, analyses, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

Course Content**UNIT I****10 HOURS**

Programming Process: Steps in developing of a program, Data Flow Diagram, Algorithm development, Flowchart, Testing and Debugging. Fundamentals of C Languages: History of C, Character Set, Identifiers and Keywords, Constants, Types of C Constants, Rules for Constructing Integer, Real and character Constants, Variables, Data Types, rules for constructing variables.

Operators and Expressions: C Instructions, Arithmetic operators, Relational operators, Logical operators, Assignment Operators, Type Conversion in Assignments, Hierarchy of Operations, Standard and Formatted Statements, Structure of a C program, Compilation and Execution.

UNIT II**15 HOURS**

Decision Control Structure: Decision making with IF-statement, IF-Else and Nested IF-Else, The else if Clause. Loop Control Structure: While and do-while, for loop and Nested for loop, Case Control Structure: Decision using switch, The goto statement. Functions: Library functions and user defined functions, Global and Local variables, Function Declaration, Calling and definition of function, Methods of parameter passing to functions, recursion, Storage Classes in C.

UNIT III**10 HOURS**

Arrays: Introduction, Array declaration, accessing values in an array, initializing values in an array, Single- and Two-Dimensional Arrays, initializing a 2-Dimensional Array, Memory Map of a 2-Dimensional Array, Passing array elements to a function: Call by value and call by reference, Arrays of characters, Insertion and deletion operations, Searching the elements in an array, Using matrices in arrays, Passing an Entire Array to a Function.

Pointers: Pointer declaration, Address operator "&", Indirection operator "*", Pointer and arrays, Pointers and 2-Dimensional Arrays, Pointer to an Array, Passing 2-D array to a Function, Array of Pointers.

UNIT IV**10 HOURS**

String Manipulation in C: Declaring and Initializing string variables, Reading and writing strings, String Handling functions (strlen(), strcpy(), strcmp(), strcat()). Structures and Unions: Declaration of structures, Structure Initialization, Accessing structure members, Arrays of structure, Nested structures, Structure with pointers, Union. Files in C: Introduction, Opening and Closing files, Basic I/O operation on files.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning, Interactive lectures.

Suggested Reading:

- Balagurusamy, E. (n.d.). *Programming with C language*. Tata McGraw-Hill.
- Schaum Series. (n.d.). *Programming in C*. McGraw-Hill.
- Salaria, R. S. (n.d.). *Application programming in C*. Khanna Book Publishing.
- Kanetkar, Y. P. (n.d.). *Let us C*. BPB Publications.
- Salaria, R. S. (n.d.). *Test your skills in C*. Salaria Publications.
- Gottfried, B. S. (n.d.). *Programming in C*. McGraw-Hill.
- Somashekara, M. T. (n.d.). *Programming in C*. Prentice Hall of India.

Web Sources

- <https://hamrocsit.com/note/c-program/problem-solving-computer/>
- [https://learnprogramo.com/problem-solving-through-programming-in-c- 1/](https://learnprogramo.com/problem-solving-through-programming-in-c-1/)
- <https://www.includehelp.com/c-programming-examples-solved-c-programs.aspx>

Course Title: Computer Fundamentals	L	T	P	Cr.
Course Code: BCA1101	3	0	0	3

Total Hours:45

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Classify binary, hexadecimal and octal number systems and their arithmetic operations.
- CO2. Analyze the concept of computer devices and the recognition of the basic terms used in computer programming.
- CO3. Identify and learn the details of the components of a personal computer system.
- CO4. Demonstrate the functions of computer programming languages.

Course Content

UNIT I

10 HOURS

Computer Fundamentals: Block diagram of a computer, characteristics of computers, and generations of computers.

Number System: Non-positional and positional number systems, Base conversion, Concept of Bit and Byte, binary, decimal, hexadecimal, and octal systems, conversion from one system to another. Binary Arithmetic: Addition, subtraction, and multiplication

UNIT II

10 HOURS

Input Devices: Keyboard, Mouse, Joy Stick, Track Ball, Touch Screen, Light Pen, Digitizer, Scanners, Speech Recognition Devices, Optical Recognition devices: OMR, OBR, OCR

Output Devices: Monitors, Impact Printers - Dot matrix, Character and Line printer, Non-Impact Printers – Desk Jet and Laser printers, Plotter.

UNIT III

15 HOURS

Memories: Memory Hierarchy, Primary Memory – RAM, ROM, Cache memory. Secondary Storage Devices - Hard Disk, Compact Disk, DVD, Flash memory.

Software: Types of Software- System Software, Application Software, Firmware. Type of System Software: Operating Systems, Language Translators

UNIT IV

10 HOURS

Computer Languages: Machine language, assembly language, high-level language, 4GL. Internet Related Concepts: Internet, World Wide Web, Hypertext, Uniform Resource Locatr, Web Browsers, IP Address, Domain Name, Internet Security, Web Search Engine.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning. Interactive lectures

Suggested Readings

- Sinha, P. K., & Sinha, P. (2002). *Foundations of computing* (1st ed.). BPB Publications.
- Sanders, D. H. (1988). *Computers today* (4th ed.). McGraw-Hill.
- Rajaraman, V. (1996). *Fundamentals of computers* (2nd ed.). Prentice Hall of India.
- Jain, S. (1999). *Information technology*. BPB Publications.

Web Sources

- <https://byjus.com/govt-exams/computer-fundamentals/>
- <https://www.chtips.com/computer-fundamentals/what-is-computer-fundamentals/>
- https://www.tutorialspoint.com/computer_fundamentals/index.htm

Course Title: Fundamentals of Math	L	T	P	Cr.
Course Code: BCA1102	4	0	0	4

Total Hours:60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Have a clear understanding of mathematical functions.
- CO2. Develop an in-depth knowledge of mathematical theories.
- CO3. Develop skills to get employment IT and Analysis field.
- CO4. Solve first order linear and non-linear differential equation and linear differential equations of higher order using various techniques.

Course Content

UNIT I 15 HOURS

Set Theory: Introduction, Sets and Elements, Subsets, Venn Diagrams, Set Operations, Algebra of Sets, Duality, Finite Sets, Counting Principle, Classes of Sets, Power Sets, Partitions, Mathematical Induction.

Relations: Introduction, Product Sets, Relations, Pictorial Representations of Relations, Composition of Relations, Types of Relations, Closure Properties, Equivalence Relations, Partial Ordering Relations

UNIT II 15 HOURS

Functions: Introduction, Functions, One-to-One, Onto, and Invertible Functions, Mathematical Functions, Exponential and Logarithmic Functions, Mathematical Functions.

UNIT III 15 HOURS

Matrices: Types of Matrices (Row, column, square, rectangular, identity, zero, diagonal etc), addition, subtraction, multiplication, transpose of a matrix. Symmetric matrix and skew-symmetric matrix, minors and cofactors.

UNIT IV 15 HOURS

Determinants: Definition and notation of determinants, Expansion of determinants (2x2,3x3), Determinant of the identity matrix and triangular matrix.

Transactional Mode

Lecture Method, E-Team Teaching, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, and Collaborative Learning.

Suggested Readings

- Mathematics for Class 12" by NCERT
- Epp, S. S. (2010). *Discrete mathematics with applications*. Cengage learning.
- Biggs, N. L. (2002). *Discrete mathematics*. Oxford University Press
- Ross, K. A., & Wright, C. R. (1985). *Discrete Mathematics*. Prentice-Hall, Inc.

Web Sources

- <https://www.geeksforgeeks.org/discrete-mathematics-tutorial/>
- https://www.tutorialspoint.com/discrete_mathematics/index.htm
- <https://mathworld.wolfram.com/>

Course Title: Programming in C Lab	L	T	P	Cr.
Course Code: BCA1103	0	0	2	1

Total Hours: 30

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Identify the difference between the top-down and bottom-up approach.
- CO2. Develop a given program using the basic elements like control statements.
- CO3. Implement the Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
- CO4. Analyze an algorithmic solution for a given problem.

Course Content

1. Write a C Program to find largest of three numbers.
2. Write a C Program to find simple and compound interest.
3. Write a C Program to find whether a given number is prime number or not.
4. Write a C Program to generate and print first 'n' FIBONACCI numbers.
5. Write a C Program that reverse a given integer number and check whether the number is palindrome or not.
6. Write a C Program to swap two numbers without using third variable.
7. Write a C Program to find if a character is alphabetic or numeric or special character.
8. C Program to Check Whether a Number is Positive, Negative, or Zero
9. Write a C Program to display result of a student using switch statement.
10. Write a C Program to print pyramid patterns using loops.
11. C Program to Generate Multiplication Table.
12. C Program to Find the Maximum and Minimum in an Array
13. Write a C Program to read two matrices and perform addition and subtractions of two matrices.
14. Write a Program to find the factorial of a number using function.
15. Write a C Program to compute the sum of even numbers and the sum of odd numbers using a function.

16. Write a C Program to accept a sentence and convert all lowercase characters to uppercase and vice -versa.
17. Write a C Program to find the length of a string without using the built – in function.
18. Write a C Program using structures, to accept different goods with the number, price and date of purchase and display those.
19. C Program to Store Student Records as Structures and Sort them by Name.
20. Write a C Program to demonstrate pointers in C.

Web Sources

- <https://www.programiz.com/c-programming>
- <https://www.geeksforgeeks.org/c-programming-language/>
- <https://www.tutorialspoint.com/cprogramming/index.htm>

Course Title: Computer Fundamentals Lab	L	T	P	Cr.
Course Code: BCA1104	0	0	2	1

Total Hours: 30

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Compose, format and edit a word document.
- CO2. Edit and forward email messages (with or without attachments).
- CO3. Utilize the MS PowerPoint with custom animation and slide orientation.
- CO4. Perform coding in different programs with practical knowledge.

Course Content

Experiment 1:

Operating System Basics

- Booting and shutting down the computer.
- Exploring the desktop, taskbar, start menu, and control panel.

Experiment 2:

File and Folder Management

- Creating, renaming, moving, copying, and deleting files and folders.
- Using USB drives and external media.

Experiment 3:

Text Editing Using Notepad/WordPad

- Basic text editing: cut, copy, paste, and format text.

Experiment 4:

Word Processing using Microsoft Word

- Creating, formatting, saving, and printing documents.
- Using tables, headers, footers, and templates.

Experiment 5:

Spreadsheets using Microsoft Excel

- Creating and formatting spreadsheets.
- Using basic formulas and functions (SUM, AVERAGE).
- Creating simple charts and graphs.

Experiment 6:

Presentation using Microsoft PowerPoint

- Create engaging presentations in Microsoft PowerPoint.
- Experiment with different slide layouts and designs.
- Add transitions and animations to enhance the presentation.
- Insert multimedia elements like images, videos, and audio.
- Practice presenting using the built-in Presenter View.

Web Sources

- <https://support.microsoft.com/en-us/windows>
- <https://support.microsoft.com/en-us/office>
- <https://edu.gcglobal.org/en/topics/office/>

Course Title: Creative Writing & Presentations	L	T	P	Cr.
Course Code:	0	0	4	2

Total Hours:

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Create professional documents using word processing tools.
- CO2. Design effective presentations with multimedia elements.
- CO3. Analyze and visualize data using spreadsheets and graphics.
- CO4. Utilize AI tools for creative writing, content generation, and presentations.

Course Contents**List of experiments**

1. Create and format professional documents using MS Word with fonts, paragraphs, page layout, headers, footers, and page numbering.
2. Design documents using styles, themes, templates, tables, images, shapes, and SmartArt in MS Word.
3. Develop a creative writing document (essay, report, business letter, or technical document) using appropriate formatting standards.
4. Design a professional presentation using PowerPoint with themes, layouts, text, images, icons, and multimedia elements.
5. Create interactive presentations using SmartArt, infographics, transitions, animations, hyperlinks, and action buttons.
6. Create and format spreadsheets in Excel using data entry techniques, formulas, functions, sorting, filtering, and conditional formatting.
7. Develop charts and graphs (Bar, Column, Line, Pie, and Area Charts) to visualize and interpret data.
8. Create AI-powered presentations and generate images using generative AI tools for educational and professional purposes.
9. Mini Project: Develop an AI-assisted communication project integrating creative writing, MS Word, PowerPoint, Excel data visualization, AI-generated images, and appropriate prompt engineering techniques.

Web Sources

- <https://support.microsoft.com/en-us/office>
- <https://edu.gcfglobal.org/en/topics/office/>
- <https://www.canva.com/learn/>

Course Title: PC Assembly & Troubleshooting	L	T	P	Cr.
Course Code: BCA1106	1	0	6	3

Total Hours:90

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Knowledge about the motherboard, bios and storage device features and its functions.
- CO2. Install OS (Linux/windows) on their systems.
- CO3. Get knowledge about ports and wires.
- CO4. Install system and software applications.
- CO5. Get knowledge about Create disk partitioning.

Course Content

1. Introduction of Hardware and Software/components of computer.
2. Mother boards, Chipsets & Microprocessor concept & latest available in market.
3. Basics &Types of Floppy drive/HDD/DVD/RAM /SMPS//BIOS.
4. Assembling of different parts of computers.
5. Knowing ports, wires attached in the Computer.
6. Installation of OS(Linux/Windows).
7. Installation of application and utility software.
8. Networking Basics: Different types of Topologies and their configuration.
9. Types of Switches, I/O Sockets.
10. Creation of Cross Wires and Direct Cables.
11. IP & Setting up a computer on LAN.

Web Sources

- <https://www.comptia.org/content/guides/what-is-computer-hardware>
- <https://www.cisco.com/c/en/us/support/docs/ip/open-shortest-path-first-ospf/13684-1.html>
- <https://www.geeksforgeeks.org/computer-network-tutorials/>

Course Title: Principles and Practices of Management	L	T	P	Cr.
Course Code: BCA1107	3	0	0	3

Total Hours:45

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Understand the fundamental principles and functions of management in organizational contexts.
- CO2. Apply management practices to plan, organize, lead, and control effectively.
- CO3. Analyze real-world business scenarios to develop problem-solving and decision-making skills.
- CO4. Demonstrate the ability to manage resources and foster teamwork for achieving organizational goals.

Course Content

UNIT I

10 HOURS

Forms of Business Organizations and Ownership: Sole Proprietorship, Partnership, Joint Stock Company, Public & Private undertakings, Government Companies. Management: Meaning & Definition of Management, Nature, Scope and its various functions. Evolution of management thoughts: classical and new classical systems, contingency approaches, Scientific management.

UNIT II

15 HOURS

Planning: nature, purpose and functions, types of plan, Management by Objective (MBO), steps in planning. Decision Making: Meaning, Steps in Decision Making, Techniques of Decision Making. Strategic planning – concepts, process, importance and limitations; Growth strategies- Internal and external.

UNIT III

10 HOURS

Organizing: Concept, formal and informal organizations, task force, bases of departmentation, different forms of organizational structures, avoiding organizational inflexibility. Teamwork – meaning, types and stages of team building. Concept of staffing– Recruitment and Selection. Motivation – concept, importance and theories.

UNIT IV

10 HOURS

Authority: definition, types, responsibility and accountability, delegation, decentralization v/s centralization, determinants of effective decentralization. Line and staff authority. Control: function, process and types of control, nature, process, significance and span of control. Direct control v/s preventive control. Trends and challenges of management in global scenario, emerging issues in management: Introduction to Total Quality Management (TQM), Just in Time (JIT).

Transactional Mode

Lecture Method, E-Team Teaching, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, and Collaborative Learning.

Suggested Readings:

- Prasad, L. M. (2021). *Principles and practice of management* (Latest ed.). S. Chand Publishing.
- Koontz, H., & Weihrich, H. (2015). *Essentials of management: An international, innovation, and leadership perspective* (10th ed.). McGraw Hill Education.
- Robbins, S. P., & Coulter, M. (2021). *Management* (15th ed.). Pearson Education.
- Rao, V. S. P., & Krishna, V. H. (2018). *Management: Text and cases*. Excel Books.

Web Sources

- <https://www.managementstudyguide.com/>
- https://www.tutorialspoint.com/management_concepts/index.htm
- <https://openstax.org/details/books/principles-management>

Course Title: Human Values and Professional Ethics	L	T	P	Cr.
Course Code: VAC0002	2	0	0	2

Total Hours:30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Develop an understanding of core human values and their role in decision-making.
- CO2. Demonstrate ethical behavior in personal and professional environments.
- CO3. Analyze the impact of ethical practices on societal and organizational well-being.
- CO4. Cultivate a responsible attitude towards sustainability and social justice.

Course Content

UNIT I

7 HOURS

Need, guidelines, content, and process of value education.; Self-exploration: meaning, content, and process; Natural acceptance and experiential validation; Human aspirations: happiness and prosperity; Right understanding, relationships, and physical facilities, Understanding harmony and fulfillment of human aspirations at different levels.

UNIT II

8 HOURS

Human being as co-existence of 'I' and Body; Needs of Self ('I') and Body: Sukh and Suvidha; Body as an instrument of 'I'; Characteristics and activities of 'I' and harmony in 'I'; Harmony between 'I' and Body: Sanyam and Swasthya; Physical needs and meaning of prosperity; Programs for ensuring Sanyam and Swasthya.

UNIT III

8 HOURS

Harmony in family as the basic unit of human interaction; Values in human relationships: Nyaya, Vishwas, and Samman; Difference between intention and competence; Difference between respect and differentiation; Other important values in relationships; Harmony in society: Samadhan, Samridhi, Abhay, and Sah-astitva; Concept of Undivided Society and Universal Order.

UNIT IV

7 HOURS

Harmony in nature, interconnectedness among the four orders of nature, recyclability and self-regulation in nature, co-existence (Sah-astitva), and harmony at all levels of existence. Human values, ethical human conduct, humanistic education, humanistic constitution, and universal human order. Professional ethics, eco-friendly technologies, management systems, holistic production systems, and the role of individuals and society in achieving Universal Human Order.

Transactional Mode

Lecture Method, E-Team Teaching, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, and Collaborative Learning.

Suggested Reading:

- Gaur, R. R., Sangal, R., & Bagaria, G. P. (2009). *A foundation course in human values and professional ethics*. Excel Books.
- Illich, I. (1974). *Energy and equity*. Harper & Row.
- Schumacher, E. F. (1973). *Small is beautiful: Economics as if people mattered*. Blond & Briggs.
- George, S. (1976). *How the other half dies: The real reasons for world hunger*. Penguin Books.
- Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W., III. (1972). *The limits to growth: A report for the Club of Rome's project on the predicament of mankind*. Universe Books.
- Nagraj, A. (1998). *Jeevan vidya: Ek parichay*. Divya Path Sansthan.
- Dhar, P. L., & Gaur, R. R. (1990). *Science and humanism*. Commonwealth Publishers.
- Tripathy, A. N. (2003). *Human values*. New Age International Publishers.
- Palekar, S. (2000). *How to practice natural farming*. Pracheen (Vaidik) Krishi Tantra Shodh.
- Seebauer, E. G., & Berry, R. L. (2000). *Fundamentals of ethics for scientists and engineers*. Oxford University Press.
- Govindarajan, M., Natarajan, S., & Senthil Kumar, V. S. (2004). *Engineering ethics (Including human values)*. Prentice Hall of India.
- Banerjee, B. P. (2005). *Foundations of ethics and management*. Excel Books.
- Bajpai, B. L. (2004). *Indian ethos and modern management*. New Royal Book Company.

Web Sources

- <https://uhv.org.in/>
- <https://www.aicte-india.org/education/Universal-Human-Values>
- <https://nptel.ac.in/courses/109104068/>

Course Title: Communication Skills I	L	T	P	Cr.
Course Code: BCA1108	2	0	0	2

Total Hours:30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Formulate an outline for effective Organizational Communication.
- CO2. Summarize the information, ideas, concepts and opinions from a variety of sources.
- CO3. Attain the competence in oral, written, and visual communication.
- CO4. Learn the correct practices about the strategies of Effective Business writing.

Course Content

UNIT I 7 HOURS

Communication: Objectives & Process of Communication, Essential components of the Process of Communication, Importance and Objectives of Communication. Differences between general and technical communication. Types of Communication (Extra-personal, Intrapersonal, Interpersonal, Organizational & Mass communications).

UNIT II 8 HOURS

Basic Grammar: Parts of Speech, Articles, Tenses, Active \ passive voice, Auxiliaries and modals.

UNIT III 8 HOURS

Verbal & Non-verbal Communication: Listening, Speaking, Reading and Writing. Verbal and Non-verbal Communication.

Overcoming Communication Barriers: Identifying common communication barriers, Strategies for overcoming barriers

UNIT IV 7 HOURS

Listening Skills: Active Listening, Importance of active listening, Giving and receiving feedback.

Transactional Mode

Lecture Method, E-Team Teaching, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, and Collaborative Learning.

Suggested Reading:

- Mohanraj, J., & Mohanraj, S. (n.d.). *English online*. Orient Longman.
- Swan, M., & Walter, C. (2011). *The good grammar book* (2nd ed.). Oxford University Press.
- Pink, M., & Thomas, S. (n.d.). *English grammar, composition and effective business communication*. S. Chand Publishing.
- Raman, M., & Sharma, S. (2018). *Business communication* (2nd ed.). Oxford University Press.
- Oxford University Press. (n.d.). *Oxford business English dictionary*. Oxford University Press.
- Raman, M., & Sharma, S. (2015). *Technical communication: Principles and practice* (3rd ed.). Oxford University Press.
- Mohan, K., & Banerji, M. (2017). *Developing communication skills* (2nd ed.). Macmillan Education.

- Mitra, B. (2016). *Personality development and soft skills*. Oxford University Press.

Web Sources

- <https://www.britannica.com/topic/communication>
- https://owl.purdue.edu/owl/general_writing/index.html
- <https://www.skillsyouneed.com/ips/communication-skills.html>

SEMESTER II

Course Title: Programming using C++	L	T	P	Cr.
Course Code: BCA2150	3	0	0	3

Total Hours:45

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Discuss about the programming techniques to solve problems or errors in the C++ programming language.
- CO2. Attain the conceptual knowledge of array and string.
- CO3. Describe the constructor and class member function.
- CO4. Analyze the inheritance with the understanding of early binding and late binding.

Course Content**UNIT I****10 HOURS**

Evolution of OOP: Procedure-Oriented Programming. OOP Paradigm. Advantages and disadvantages of OOP over its predecessor paradigms.

Characteristics of Object-Oriented Programming: Abstraction, Encapsulation. Data hiding, Inheritance. Polymorphism, code Extensibility, and Reusability.

C++ Basics: Tokens, keywords, Identifiers, data types, constants, operators in C++, I/O streams, Control structures.

UNIT II**10 HOURS**

Functions in C++: Prototyping, Definition and Call, Scope Rules, Parameter Passing Value, by address and by reference, inline functions, function overloading, and Friend functions.

Arrays and Strings: creating and manipulating arrays within a class, arrays of objects, creating and manipulating String Objects, and Accessing Characters in strings.

UNIT III**10 HOURS**

Classes and Objects: Classes, Objects, and Members: Class Declaration and Class Definition, defining member functions, Defining Objects, making functions inline, Member Access Control, Nested Classes, This Pointer.

Constructors: Properties, types of constructors (Default, parameterized, and copy). Dynamic constructors, Multiple constructors in classes.

Destructors: Properties, Virtual destructors, Destroying objects. Rules for constructors and destructors.

Dynamic memory allocation using new and delete operators.

UNIT IV**15 HOURS**

Inheritance: Defining derived classes, inheriting private members, single inheritance, types of derivation, and constructors in derived classes.

Types of inheritance: Single, Multiple, Multi-level, and Hybrid.

Types of base classes: Direct, Indirect, Virtual, Abstract, and Code Reusability.

Polymorphism: Methods of achieving polymorphic behavior, virtual functions, late binding, pure virtual functions, and abstract base classes, Operator overloading. Difference between function overloading and overriding.

Open/ Close Files commands. Read/write operations on files.

Transactional Mode

Lecture Method, E-Team Teaching, Video-based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Balagurusamy, E. (2001). *Object-oriented programming with C++*. Tata McGraw-Hill.
- Pohl, I. (1993). *Object-oriented programming using C++*. Benjamin-Cummings Publishing Co., Inc.
- Dewhurst, S. C., & Stark, K. T. (1989). *Programming in C++*. Prentice- Hall, Inc.
- Lafore, R. (1997). *Object-oriented programming in C++*. Pearson Education.

Web Sources

- <https://www.learncpp.com/>
- <https://www.geeksforgeeks.org/c-plus-plus/>
- <https://www.tutorialspoint.com/cplusplus/index.htm>

Course Title: Operating Systems	L	T	P	Cr
Course Code: BCA2151	3	0	0	3

Total Hours: 45

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Describe the fundamental concepts of Operating System.
- CO2. Solve the various types of Scheduling Algorithms for better utilization of external memory.
- CO3. Attain the knowledge about deadlock detection algorithms.
- CO4. Demonstrate the components and aspects of concurrency management.

Course Content

UNIT I

10 HOURS

Fundamentals of Operating system: Introduction to Operating system, Functions of an operating system. Operating system as a resource manager. Structure of operating system (Role of kernel and Shell). Views of the operating system. Evolution and types of operating systems.

Process & Thread Management: Program vs. Process; PCB, State transition diagram, Scheduling Queues, Types of schedulers, Concept of Thread, Benefits, Types of threads, Process synchronization.

CPU Scheduling: Need of CPU scheduling, CPU I/O Burst Cycle, Preemptive vs. Non-pre-emptive scheduling, Different scheduling criteria, scheduling algorithms (FCFS, SJF, Round-Robin, Multilevel Queue).

UNIT II

15 HOURS

Memory Management: Introduction, address binding, relocation, loading, linking, memory sharing and protection; Paging and segmentation; Virtual memory: basic concepts of demand paging, page replacement algorithms.

UNIT III

10 HOURS

I/O Device Management: I/O devices and controllers, device drivers; disk storage. File Management: Basic concepts, file operations, access methods, directory structures and management, remote file systems; file protection.

UNIT IV

10 HOURS

Advanced Operating systems: Introduction to Distributed Operating system, Characteristics, & Synchronization; Introduction Multiprocessor Operating system, architecture, Issues, Communication, & Synchronization; Introduction Multiprocessor Operating system, Architecture, Structure, Synchronization & Scheduling; Introduction to Real-Time Operating System, Characteristics, Structure & Scheduling. Case study of Linux operating system.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Tanenbaum, A. (2009). *Modern operating systems*. Pearson Education, Inc.
- Coffman, E. G., & Denning, P. J. (1973). *Operating systems theory* (Vol. 973). Englewood Cliffs, NJ: prentice-Hall.
- Madnick, S. E., & Donovan, J. J. (1974). *Operating systems* (Vol. 197, No. 4). New York: McGraw-Hill.
- Deitel, H. M. (1990). *An introduction to operating systems*. Addison-Wesley Longman Publishing Co., Inc.

Web Sources

- <https://www.geeksforgeeks.org/operating-systems/>
- https://www.tutorialspoint.com/operating_system/index.htm
- <https://www.kernel.org/doc/html/latest/>

Course Title: Discrete Structures	L	T	P	Cr.
Course Code: BCA2152	4	0	0	4

Total Hours: 60

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Implement the Logical and Algebraic operations.
- CO2. Demonstrate the basic principles of relation in a set.
- CO3. Solve the various methods of Recurrence relations.
- CO4. Perform operations on sets, functions, relations, and sequences.

Course Content

UNIT I 15 HOURS

Set Theory: Introduction, Sets and Elements, Subsets, Venn Diagrams, Set Operations, Algebra of Sets, Duality, Finite Sets, Counting Principle, Classes of Sets, Power Sets, Partitions, Mathematical Induction. Relations: Introduction, Product Sets, Relations, Pictorial Representations of Relations, Composition of Relations, Types of Relations, Closure Properties, Equivalence Relations, Partial Ordering Relations Functions: Introduction, Functions, One-to-One, Onto, and Invertible Functions, Mathematical Functions, Exponential and Logarithmic Functions.

UNIT II 15 HOURS

Combinations: Rule of products, permutations, combinations. Algebra of Logic: Propositions and logic operations, truth tables and propositions generated by set, equivalence and implication laws of logic, mathematical system, and propositions over a universe, mathematical induction, quantifiers.

UNIT III 15 HOURS

Recursion and recurrence: The many faces of recursion, recurrence, relations, and some common recurrence relations, generating functions.

UNIT IV 15 HOURS

Graph Theory: Introduction, Data Structures, Graphs and Multigraphs, Subgraphs, Isomorphic and Homeomorphic Graphs, Paths, Connectivity, Traversable and Eulerian Graphs, Labeled and Weighted Graphs, Complete, Regular, and Bipartite Graphs, Planar Graphs, Graph Colorings, Representing Graphs in Computer Memory and Graph Algorithms. Directed Graphs, Sequential Representation of Directed Graphs, Warshall's Algorithm, Shortest Paths Trees: Introduction, Binary Trees, Complete and Extended Binary Trees, Representing Binary Trees in Memory, Traversing Binary Trees, Binary Search Trees

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Epp, S. S. (2010). *Discrete mathematics with applications*. Cengage learning.
- Biggs, N. L. (2002). *Discrete mathematics*. Oxford University Press
- Ross, K. A., & Wright, C. R. (1985). *Discrete Mathematics*. Prentice-Hall, Inc.

Web Sources

- <https://www.geeksforgeeks.org/discrete-mathematics-tutorial/>
- https://www.tutorialspoint.com/discrete_mathematics/index.htm
- <https://mathworld.wolfram.com/>

Course Title: Programming using C++ Lab	L	T	P	Cr.
Course Code: BCA2153	0	0	2	1

Total Hours:30

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. After the completion of the course the learner will be able to
- CO2. Classify the object-oriented concepts and their implementation.
- CO3. Use the concepts of array and string using C++.
- CO4. Implement a given program solved by C++.
- CO5. Grasp the concept of implementing the constructors with classes.

Course Content

Write a program to find whether the number is even or odd.

2. Write a program to find the greatest number out of three numbers.
3. Write a program to find whether the number is a palindrome or not.
4. Write a program to print a prime number series.
5. Write a program to find the reverse of a number.
6. Write a program to find the factorial of a number.
7. Write a program to implement switch case in C++.
8. Write a program to enter a record of 50 students.
9. Write a program to print
 - 1
 - 12
 - 123
 - 1234
 - 12345
10. Write a program to implement call by value.
11. Write a program to show call by reference in C++.
12. Write a program to create classes in C++.
13. Write a program that uses a class where the member functions are defined inside a class.
14. Write a program to demonstrate the use of static data members.
15. Write a program to demonstrate the use of keyword const data members.
16. Write a program using constructors in C++.
17. Write a program using destructors in C++.
18. Write a program using multiple constructors in C++.
19. Write a program using the Copy constructor in C++.
20. Write a program to demonstrate single inheritance.
21. Write a program to demonstrate multilevel inheritance.
22. Write a program to demonstrate multiple inheritance.
23. Write a program showing hierarchical inheritance in C++.
24. Write a program to implement function overloading.
25. Write a program to demonstrate the overloading of binary arithmetic operators.
26. Write a program showing operator overloading in C++.
27. Write a program to read and write data from a file in C++.

Web Sources

- <https://www.learncpp.com/>
- <https://www.geeksforgeeks.org/c-plus-plus/>
- <https://www.tutorialspoint.com/cplusplus/index.htm>

Course Title: Operating System Lab	L	T	P	Cr.
Course Code: BCA2154	0	0	2	1

Total Hours: 30

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Get expertise on the Unix OS platform.
- CO2. Develop and debug C programs created on UNIX platforms.
- CO3. Install the standard libraries of the Operating System.
- CO4. Classify Shell Programming in Linux.

Course Content

1. Write down the Steps to Install Linux Operating System.
2. Write down the Steps to Install XP Operating System.
3. Write and explain the File Related commands.
4. Write and explain the Directory Related commands.
5. Write and explain the Process and status information commands.
6. Write and explain the Text related commands.
7. Write and explain the command to set the File Permissions.
8. Write a shell Program for Numerical Calculations in Linux.
9. Write a shell program to create a table in Linux.
10. Write a shell program to identify Even and Odd Number in Linux.

Web Sources

- <https://ubuntu.com/tutorials>
- <https://www.geeksforgeeks.org/linux-tutorial/>
- <https://www.tutorialspoint.com/unix/index.htm>

Course Title: Introduction to Web technologies	L	T	P	Cr.
Course Code: BCA2159	2	0	0	2

Total Hours:60

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. 1. Design web pages using HTML5 and CSS.
 CO2. Apply CSS techniques to create attractive and responsive interfaces.
 CO3. Develop interactive web pages using JavaScript and DHTML.
 CO4. Build responsive websites using Bootstrap components.
 CO5. Create dynamic web applications using PHP and MySQL.

Course Content

UNIT I **7 HOURS**
 HTML, CSS Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, HTML5. CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution.

UNIT II **8 HOURS**
 Java script The Basic of Java script: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions DHTML: Positioning Moving and Changing Elements.

UNIT III **8 HOURS**
 Bootstrap: Introduction to bootstrap, grid and containers, color, Table, image, Alert, button, button groups, progress bar, spinner, card, dropdown, collapse.

UNIT IV **7 HOURS**
 PHP Programming: Introducing PHP: Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions. Working with forms and Databases such as MySQL.

Suggested Readings

- Robert W. Sebesta, *Programming the World Wide Web*, Pearson Education.
- Uttam K. Roy, *Web Technologies*, Oxford University Press.
- Bai, Ekedahl, Farrell, Gosselin, Zak, Kaparathi, MacIntyre & Morrissey, *The Web Warrior Guide to Web Programming*, Cengage Learning.
- Jon Duckett, *HTML and CSS: Design and Build Websites*, Wiley.
- Luke Welling and Laura Thomson, *PHP and MySQL Web Development*, Addison-Wesley.

Web Sources

- <https://developer.mozilla.org/en-US/docs/Learn>
- <https://getbootstrap.com/docs/>
- <https://www.php.net/manual/en/>

Course Title: Introduction to Web technologies LAB	L	T	P	Cr.
Course Code: BCA2160	0	0	4	2

Total Hours:60

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Students are able to develop a dynamic webpage by the use of java script and DHTML.
- CO2. Students will be able to write a well-formed/valid XML document.
- CO3. Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- CO4. Students will be able to write a server-side java application called Servlet to catch form data sent from client, process it and store it on database.
- CO5. Students will be able to write a server-side java application called JSP to catch form data sent from client and store it on database.

Course Content

1. Create simple Forms in HTML5 and demonstrate the use of various form elements like input box, text area, submit and radio buttons etc.
2. Demonstrate the use of Links, Lists and Tables in HTML5. You should be able to link separate pages and create named links within a document, using them to build a “table of contents”.
3. Demonstrate the use of cascading style sheets (CSS) (inline, internal and external) to specify various aspects of style, such as colours and text fonts and sizes, in HTML5 document.
4. Create an html file to implement the concept of document object model, different operations and event handling using JavaScript.
5. Demonstrate the use of various selectors, filters and event handling in jQuery.
6. Demonstrate the use of AJAX to retrieve and manipulate the web page content.
7. Demonstrate the use of GET and POST methods of AJAX.
8. Setup of development server like Xampp in windows. . Create database and tables in My SQL.
9. Create a web page to show use of all data types in PHP.
10. Fetch and display data from My SQL table in a web page using PHP
11. Implement Regular Expression, Array, Math, Date functions in PHP.
12. Handling database queries with PHP & MYSQL.
13. Working with files using PHP.
14. Write a program to manage the sessions & cookies using PHP.
15. Write an angular jsprogram which displays your name, college name and age.

Suggested Readings

- Bates, C. (2006). *Web programming: Building Internet applications* (2nd ed.). Wiley.
- Deitel, H. M., Deitel, P. J., & Nieto, T. R. (2007). *Internet & World Wide Web: How to program* (4th ed.). Pearson Education. Bergsten, H. (2000). *JavaServer Pages*. O'Reilly Media.
- Robbins, J. N. (2009). *Learning web design* (3rd ed.). O'Reilly Media.
- Aibara, F. (2010). *HTML for beginners* (2nd ed.). O'Reilly Media.
- Hall, M. (2000). *Core servlets and JavaServer Pages* (1st ed.). Prentice Hall PTR.
- Schildt, H., & Naughton, P. (1999). *The complete reference: Java 2* (5th ed.). Tata McGraw-Hill.

Web Sources

- <https://developer.mozilla.org/en-US/docs/Learn>
- <https://www.w3schools.com/>
- <https://www.php.net/manual/en/>

Course Title: Minor Project-based Learning	L	T	P	Cr.
Course Code: BCA2161	0	0	6	3

Total Hours:90

Course Learning Outcomes: After the completion of the course the learner will be able to

CO1: Create and format professional documents using word processing tools.

CO2: Design effective presentations using presentation software.

CO3: Analyze and visualize data using spreadsheet applications.

CO4: Apply AI tools for content creation and communication.

CO5: Demonstrate effective written and presentation skills.

CO6: Collaborate effectively in team-based projects and activities.

Course Content

1. Number Guessing Game
2. Digital Clock
3. Currency Converter
4. Age Calculator
5. Password Generator
6. Student Grade Calculator
7. Temperature Converter
8. Basic Chatbot
9. Stopwatch Application
10. Typing Speed Tester

Web Sources

- <https://developer.mozilla.org/en-US/docs/Learn/JavaScript>
- <https://www.w3schools.com/js/>
- <https://www.freecodecamp.org/learn/javascript-algorithms-and-data-structures/>

Course Title: Human Resource Management	L	T	P	Cr.
Course Code: BCA2157	3	0	0	3

Total Hours:45

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Understand the significance of HRM, distinguish it from Personnel Management (PM), and identify HR challenges.
- CO2. Apply HRM principles to practical situations such as recruitment, selection, and induction.
- CO3. Analyze performance appraisal methods and training programs.
- CO4. Evaluate the effectiveness of HR policies like promotion and transfer. Develop HR strategies and procedures.

Course Content

UNIT I 12 HOURS

Introduction to HRM: Definition and Concept of HRM and Personnel Management, Difference between PM and HRM, Importance of HRM, Activities and Functions of HRM, Challenges before HRM, HRD, HRP, Concept of Recruitment –Sources of Recruitment.

UNIT II 12 HOURS

Performance Appraisal, Training and Development: Meaning and Definition, Need, Objective, Importance of Training, Training Method, Evaluation of Training Program, Concept and Objective Performance Appraisal-Process of Performance Appraisal Method, Uses and Limitation of Performance Appraisal, Promotion and Demotion Policy, Transfer Policy.

UNIT III 11 HOURS

Method of Wage Payment: Employee Remuneration Factors Determining the Level of Remuneration, Profit Sharing, Fringe Benefit Nature of E-HRM, E-HR Activity, E-Recruitment, E-Selection, E-Learning, E- Compensation.

UNIT IV 10 HOURS

Grievance and Discipline: Meaning, Definition and Nature of Grievance Procedure, Grievance Machinery. Definition of Discipline: Aim and Objective of Discipline. Principle of Discipline.

Transactional Mode:

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Dessler, G. (2020). *Human resource management* (16th ed.). Pearson Education.
- Aswathappa, K. (2021). *Human resource management: Text and cases* (10th ed.). McGraw Hill Education.

- Rao, V. S. P. (2019). *Human resource management: Text and cases* (5th ed.). Excel Books.
- Gupta, C. B. (2021). *Human resource management* (20th ed.). Sultan Chand & Sons.
- Mamoria, C. B., Gankar, S. V., & Mamoria, S. (2020). *Personnel management and industrial relations* (16th ed.). Himalaya Publishing House.

Web Sources

- <https://www.managementstudyguide.com/human-resource-management.htm>
- https://www.tutorialspoint.com/human_resource_management/index.htm
- <https://openstax.org/details/books/principles-management>

Course Title: Environmental Education	L	T	P	Cr.
Course Code: VAC0001	2	0	0	2

Total Hours: 30

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Acquire the basic knowledge of Environment study.
- CO2. Attain the information about the ecosystem and its functioning.
- CO3. Discuss the role of individuals in prevention of pollution.
- CO4. Elaborate the role of information technology in the environment and human health.

Course Content

UNIT I 8 HOURS

Environmental studies: definition, scope, importance, public awareness, Natural resources: renewable & non-renewable, Forest resources and deforestation, Water resources: floods, droughts, dams, Mineral resources and environmental effects, Food resources and modern agriculture problems Energy resources: renewable & non-renewable energy, Land resources: soil erosion, desertification, landslides

UNIT II 7 HOURS

Concept, structure, and functions of an ecosystem, Components of ecosystem: producers, consumers, and decomposers, Energy flow in ecosystem, ecological succession, food chains, food webs, and ecological pyramids, Biodiversity: meaning and types – genetic, species, and ecosystem diversity, Bio-geographical classification of India, Values of biodiversity: consumptive, productive, social, ethical, aesthetic, and option values, Biodiversity at global, national, and local levels, India as a mega-diversity nation and need for biodiversity conservation.

UNIT III 7 HOURS

Environmental Pollution Definition: Causes, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards, ill-effects of fireworks, Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV 8 HOURS

Sustainable development, urban energy problems, water conservation, rainwater harvesting, and watershed management. Resettlement and rehabilitation issues, environmental ethics, climate change, global warming, acid rain, ozone depletion, nuclear accidents, wasteland reclamation, consumerism, and waste management. Environmental laws including Environment Protection Act, Air Act, Water Act, Wildlife Protection Act, and Forest Conservation Act with issues in implementation. Population growth, population explosion, family welfare programmes, human health, human rights, value education, HIV/AIDS, and women and child welfare.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer

Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Agarwal K.C. (2001). *Environment Biology*, Nidi Publ. Ltd. Bikaner.
- Jadhav H & Bhosale (1995). *Environment Protection and Laws*, Himalaya Pub House, Delhi.
- Rao M. N. & Datta A.K. (1987). *Waste Water, Treatment Oxford & IBH Publ. Co. Pvt. Ltd.*

Web Sources

- UNEP (United Nations Environment Programme)
- Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India
- World Health Organization – Environmental Health

Course Title: Communication Skills - II	L	T	P	Cr.
Course Code: BCA2158	2	0	0	2

Total Hours: 30

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Formulate an outline for effective Organizational Communication.
- CO2. Summarize the information, ideas, concepts and opinions from a variety of sources.
- CO3. Attain the competence in oral, written, and visual communication.
- CO4. Learn the correct practices about the strategies of Effective Business writing.

Course Content

UNIT I 6 HOURS

Writing Skills: Formal & Informal writings, report writing, creative writing. Composition, Resume Writing, Cover letters.

UNIT II 9 HOURS

Business Letter Writing, Persuasive Letters, Job Applications and Official Correspondence, E-Mail, Precise writing.

UNIT III 7 HOURS

Basic Writing and Reading Skills: Principles of Effective Writing, Writing Emails, Letters, and Memos. This involves clarity, concision, and proper tone to convey messages effectively in professional settings.

UNIT IV 8 HOURS

Writing: Biographical writing about one place or person, Free writing on any topics (my favourite place/hobbies/school life etc.), Sentence Completion, Autobiographical writing (about one's leisure time activities, hometown etc.).

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Kumar, S., & Lata, P. (2011). *Communication skills*. Oxford University Press.
- Training, M. T. D. (2012). *Effective communication skills*. Bookboon.
- Hargie, O. (Ed.). (1986). *The handbook of communication skills* (p. 37). London: Croom Helm.

Web Sources

- https://owl.purdue.edu/owl/general_writing/index.html
- <https://www.skillsyouneed.com/write/>
- <https://www.bbc.co.uk/learningenglish/english/course/intermediate/unit>

SEMESTER III

Course Title: Data Structures	L	T	P	Cr.
Course Code: BCA3200	3	0	0	3

Total Hours: 45

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Apply appropriate constructs of Programming language, coding standards for application development.
- CO2. Select appropriate data structures for problem solving and programming
- CO3. Identify appropriate searching and/or sorting techniques for a wide range of problems and data types.
- CO4. Differentiate between various types of data structures.

Course Content**UNIT I****10 HOURS**

Introduction to Data Structures: Algorithms and Flowcharts, Basics Analysis on Algorithm, Complexity of Algorithm, Introduction and Definition of Data Structure, Classification of Data, Arrays, Various types of Data Structure, Static and Dynamic Memory Allocation, Function, Recursion.

Arrays, Pointers and Strings: Introduction to Arrays, Definition, One Dimensional Array and Multi-Dimensional Arrays, Pointer, Pointer to Structure, various Programs for Array and Pointer. Strings. Introduction to Strings, Definition, Library Functions of Strings.

UNIT II**15 HOURS**

Stacks and Queue: Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks. Implementation of Multiple Stack Queues, Introduction to Queue, Definition, Queue Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue.

UNIT III**10 HOURS**

Linked Lists and Trees: Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, and Circular Doubly Linked List.

Trees: Introduction to Tree, Tree Terminology Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree.

UNIT IV**10 HOURS**

Graphs, Searching, Sorting and Hashing Graphs: Introduction, Representation to Graphs, Graph Traversals Shortest Path Algorithms. Searching and Sorting: Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort.

Hashing: Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Hubbard, J. R. (2007). *Schaum's outline of data structures with Java*. McGraw-Hill.
- Horowitz, E., & Sahni, S. (1976). *Fundamentals of data structures*. Computer Science Press.
- Wirth, N. (1985). *Algorithms + data structures = Programs*. Prentice Hall.
- Tarjan, R. E. (1983). *Data structures and network algorithms*. Society for Industrial and Applied Mathematics (SIAM).

Web Sources

- <https://www.geeksforgeeks.org/data-structures/>
- <https://www.programiz.com/dsa>
- https://www.tutorialspoint.com/data_structures_algorithms/index.htm

Course Title: Relational Database Management System	L	T	P	Cr.
Course Code: BCA3201	3	0	0	3

Total Hours: 45

Course Learning Outcomes: After the completion of the course the learner will be able to

CO1. After the completion of the course the learner will be able to

CO2. Identify the difference about database systems from the file systems by enumerating their features.

CO3. Acknowledge the role of the database administrator.

CO4. Retain the knowledge about physical and logical database designs.

CO5. Converts an Entity-Relationship diagram to Relational Schema.

Course Content

UNIT I

10 HOURS

Introduction of DBMS: Data Modeling for a Database, Three level Architecture of DBMS, Components of a DBMS.

Introduction to Data Models: Hierarchical, Network and Relational Model, Comparison of Network, Hierarchical and Relational Model, Entity Relationship Model.

UNIT II

15 HOURS

Relational Database: Relational Algebra and Calculus, SQL Fundamentals, DDL, DML, DCL, PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Triggers.

UNIT III

10 HOURS

Introduction to Normalization: First, Second, Third Normal Forms, Dependency Preservation, Boyce-Codd Normal Form, Multi-valued Dependencies and Fourth Normal Form, Joins: Inner join, left join, Right join, Full join, Join Dependencies and Fifth Normal Form, Domain-key normal form (DKNF).

UNIT IV

10 HOURS

Database Recovery: Concurrency Management, Database Security, Integrity and Control. Structure of a Distributed Database, Design of Distributed Databases.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning

Suggested Readings

- Ramakrishnan, R., & Gehrke, J. (2003). *Database management systems* (3rd ed.). McGraw-Hill.
- Korth, H. F., Silberschatz, A., & Sudarshan, S. (2019). *Database system concepts* (7th ed.). McGraw-Hill Education.
- Lu, G. (1999). *Multimedia database management systems*. Artech House.

- Date, C. J. (2004). *An introduction to database systems* (8th ed.). Pearson Education.

Web Sources

- <https://www.geeksforgeeks.org/dbms/>
- <https://www.tutorialspoint.com/dbms/index.htm>
- <https://www.w3schools.com/sql/>

Course Title: Digital Electronics	L	T	P	Cr.
Course Code: BCA3202	4	0	0	4

Total Hours: 60

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Classify the fundamental concepts and techniques used in digital electronics.
- CO2. Apply the principles of number system, binary codes and Boolean algebra to minimize logic expressions.
- CO3. Identify the basic requirements for designing an application.
- CO4. Analyze the various hazards in a digital design.

Course Content

UNIT I 15 HOURS

Fundamental Concepts: Introduction to Analog and Digital Systems, Digital Signals, Basic Digital Circuits: AND, OR, NOT, NAND, NOR, XOR and XNOR gates. Boolean algebra Theorems, Characteristics of Digital IC. Number Systems: Positional and Non-positional number systems, Binary, Decimal, Octal and Hexadecimal, Base conversions, Binary arithmetic: Addition and Subtraction, 1's complement, 2's complement, subtraction using 1's complement and 2's complement.

UNIT II 15 HOURS

Combinational Logic Design: SOP and POS Representation of Logic functions, K-Map representation and simplification up to 4 variable expressions, don't care condition. Multiplexers: 4X1, 8X1 and 16X1. De-multiplexers: 1 to 4, 1 to 8 and 1 to 16. BCD to Decimal decoder, Decimal to BCD encoder. Parity generator and Parity checker. Design of Half adder and Full adder.

UNIT III 15 HOURS

Flip-Flops: Introduction, Latch, Clocked S-R Flip Flop, Preset and Clear signals, D-Flip Flop, J-K Flip Flop, The race-around condition, Master Slave J-K Flip Flop, D-Flip-Flop, Excitation Tables of Flip Flops. Edge- Triggered Flip Flops

UNIT IV 15 HOURS

A/D and D/A Converters: Introduction, Digital to Analog Converters: Weighted-Register D/A converter, R-2R Ladder D/A converter. Analog to Digital Converters: Quantization and encoding, Parallel- comparator A/D converter, Counting A/D converter.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Jain, R. P. (2003). *Modern digital electronics* (3rd ed.). Tata McGraw-Hill Education.
- Maini, A. K. (2007). *Digital electronics: Principles, devices, and applications*. John Wiley & Sons.
- Pedroni, V. A. (2008). *Digital electronics and design with VHDL*. Morgan Kaufmann.
- Balch, M. (2003). *Complete digital design: A comprehensive guide to digital electronics and computer system architecture*. McGraw-Hill Education.

Web Sources

- <https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/>
- https://www.tutorialspoint.com/digital_circuits/index.htm
- <https://nptel.ac.in/courses/117106086/>

Course Title: Data Structures Lab	L	T	P	Cr.
Course Code: BCA3203	0	0	2	1

Total Hours: 30

Course Learning Outcomes: After the completion of the course the learner will be able to

- CO1. Apply appropriate constructs of Programming language, coding standards for application development
- CO2. Select appropriate data structures for problem solving and programming
- CO3. Identify appropriate searching and/or sorting techniques for a wide range of problems and data types.
- CO4. Differentiate between various types of data structures.

Course Content

1. Write a program to insert an element into an array
2. Write a program to delete an element from an array.
3. Write a program to implement linear search algorithm
4. Write a program to implement binary search algorithm
5. Write a program to implement a bubble sort algorithm.
6. Write a program to implement a selection sort algorithm.
7. Write a program to implement PUSH operation in stacks.
8. Write a program to implement POP operation in stacks.
9. Write a program to implement Queues.
10. Write a program to insert an element in the beginning of the link list.
11. Write a program to insert an element in the middle of the link list.
12. Write a program to insert an element in the end of the link list.
13. Write a program to delete an element from the beginning of the link list.
14. Write a program to delete an element from the end of the link list.
15. Write a program for implementation of a graph.
16. Write a program for implementation of binary search trees.

Web Sources

- <https://www.geeksforgeeks.org/data-structures/>
- <https://www.programiz.com/dsa>
- https://www.tutorialspoint.com/data_structures_algorithms/index.htm

Course Title: Relational Database Management Systems Lab	L	T	P	Cr.
Course Code: BCA3204	0	0	2	1

Total Hours: 30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Solve the query of the database using SQL DML / DDL commands.
- CO2. Enforce integrity constraints on a database.
- CO3. Apply the basic concepts of Database Systems and Applications.
- CO4. Design a commercial relational database system (Oracle, My SQL) by writing SQL using the system

List of Experiments

1. Introduction to DBMS & SQL.
2. To implement Various DDL comments.
3. Implement the DML commands.
4. Study of Various types of data Constraints and implementation.
5. Study of all types of operators.
6. Implement the concept of Set Operators.
7. Explore select clauses -order by, having etc.
8. Implement the concept of Inbuilt Function.
9. Implement the concept of Joins,
10. Implement the concept of views.
11. Implement the concept of Indexes

Web Sources

- <https://www.geeksforgeeks.org/data-structures/>
- <https://www.programiz.com/dsa>
- https://www.tutorialspoint.com/data_structures_algorithms/index.htm

Course Title: Multimedia and its Applications	L	T	P	Cr.
Course Code: BCA3205	2	0	0	2

Total Hours:30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Understand the basic concepts of multimedia, including text, audio, video, animation, and graphics.
- CO2. Apply multimedia tools and techniques to create interactive presentations and digital content.
- CO3. Demonstrate knowledge of multimedia file formats, data compression, and storage techniques.
- CO4. Develop simple multimedia applications using authoring tools and multimedia software.

Course Content

UNIT I 5 HOURS

Definition: Classification, Multimedia application, Multimedia Hardware, Multimedia software, CDROM, DVD.

UNIT II 5 HOURS

Multimedia Audio: Digital medium, Digital audio technology, sound cards, recording, editing, MP3, MIDI fundamentals, Working with MIDI, audio file formats, adding sound to Multimedia project.

UNIT III 10 HOURS

Multimedia Text: Text in Multimedia graphics, coloring, digital imaging fundamentals, development and editing, file formats, scanning and digital photography.

UNIT IV 10 HOURS

Multimedia Animation: Computer animation fundamentals, Kinematics, morphing, animation s/w tools and techniques. Multimedia Video: How video works, broadcast video standards, digital video fundamentals, digital video production and editing techniques, file formats.

Multimedia Project: stages of project, Multimedia skills, design concept, authoring, planning and costing, Multimedia Team. Multimedia, looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing.

Transactional Mode:

Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Gokul, S. (n.d.). Multimedia magic (2nd ed.). BPB Publications.
- Vaughan, T. (n.d.). Multimedia: Making it work (6th ed.). Tata McGraw-Hill.

- Thakrar, K., & Kandleigh, P. (n.d.). Multimedia system design. Prentice Hall India.
- Pakhira, M. K. (n.d.). Computer graphics, multimedia and animation (2nd ed.). Prentice Hall India.

Web Sources

- <https://www.tutorialspoint.com/multimedia/index.htm>
- <https://www.geeksforgeeks.org/multimedia-systems/>
- <https://nptel.ac.in/courses/106105163/>

Course Title: Multimedia and its Applications Lab	L	T	P	Cr.
Course Code: BCA3206	0	0	4	2

Total Hours:60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Identify and utilize various tools for multimedia processing.
- CO2. Design the images with appropriate tools from the toolbox.
- CO3. Apply practical knowledge to create image animations.
- CO4. Implement the experiments with graphics and text information.

Course Content

1. Procedure to create an animation to represent the growing moon.
2. Procedure to create an animation to indicate a wall bouncing on steps.
3. Procedure to simulate movement of a cloud.
4. Procedure to draw the fan blades and to give proper animation.
5. Procedure to display the background given through your name.
6. Procedure to create an animation with the following features: WEL COME Letter should appear one by one. The fill Color of the text should change to a different Color after the display of full word.
7. Procedure to simulate a ball hitting another ball.
8. Procedure to create an animated cursor using STARTDRAG ("SS", TRUE); MOUSE. HIDE ();
9. Procedure to design a visiting card containing at least one graphic and text information.
10. Procedure to take a photographic image. Give the title for the image and put the border. Write your names. Write the institution and place.
11. Procedure to prepare a cover page for the book in your subject area. Plan your own design.
12. Selecting your own background for organization.
13. Picture so that it gives an elegant look.
14. Procedure to picture preferably on a plain background of a color of your Choice-Positioning Includes rotation and scaling.
15. Procedure to remove the arrows and text from the given photographic image.
16. Procedure to type a word and apply the effects shadow embossed.
17. Procedure to use appropriate tools(s) from the toolbox: cut the object from three files, organize them in a single file and apply feather effects.
18. Procedure to display the background given through your name using a mask.
19. Procedure to make anyone of one of the parrots black and white in a given picture.
20. Procedure to change a circle into a square using flash.

Web Sources

- <https://helpx.adobe.com/animate/tutorials.html>
- <https://helpx.adobe.com/photoshop/tutorials.html>
- https://www.tutorialspoint.com/computer_graphics/index.htm

Course Title: Organizational Behavior	L	T	P	Cr.
Course Code: BCA3207	3	0	0	3

Total Hours:45

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. To expose the students to the fundamentals of Organizational Behavior (OB)
CO2. such as working with people, nature of organizations, communication, leadership and motivation of people.
CO3. To help students develop a conceptual understanding of OB theories
CO4. To enable the students to put the ideas and skills of OB into practice

Course Content

UNIT I 10 HOURS

Introduction to Organizational Behavior: Definition, Evolution of the Concept of OB, Contributions to OB by major behavioral science disciplines, Challenge and Opportunities for OB managers, Models of OB study.

UNIT II 10 HOURS

Foundations of Individual Behavior Attitudes and Job Satisfaction, Components of Attitude, Major Job Attitude, Job Satisfaction, Personality and Values, Personality Determinants, MBTI, Big – Five Model, Values, Formation, Types of Values, Perception, Factors influencing perception.

UNIT III 10 HOURS

Motivation and Leadership Motivation and Leadership Concept of motivation, Definition, Theories of Motivation, Maslow's need Theory, ERG Theory, Theory X and Theory Y, Two Factor Theory, McClelland's Theory, Equity Theory, Vroom's Expectancy Theory. Concept of Leadership, Theories of leadership, Traits of good Leader, Difference between Leader and Manager

UNIT IV 15 HOURS

Foundations of Group Behavior, Formation of Group, Group - Classification, Properties, Roles, norms, status, size and cohesiveness, Group decision making, understanding teams, creating effective teams, Conflict Process, Conflict management communication. Culture, Definition, Culture's function, need and importance of Cross-Cultural management, Stress and its Management.

Suggested Reading:

- Kavita Singh, *Organizational Behavior*, Vikas Publications
- Robbins, Timothy Judge, Seema Sanghi, *Organizational Behavior*, Stephen Pearson Prentice Hall, 12 edition
- Fred Luthans, *Organizational Behavior*, McGraw Hill Inc.
- John Newstrom and Keith Davis, *Organizational Behavior*, Tata McGraw Hill, 11 edition

- AshwaThapa, *Organizational Behavior*

Web Sources

- <https://www.managementstudyguide.com/organizational-behavior.htm>
- https://www.tutorialspoint.com/organizational_behavior/index.htm
- <https://openstax.org/details/books/organizational-behavior>

Course Title: Soft Skills and Personality Development	L	T	P	Cr.
Course Code: BCA3209	2	0	0	2

Total Hours:30

Course Learning Outcomes: After completion of this course, the learner will be able to:

CO1. Student will get Effective Communication Skills.

CO2. Develop good Interpersonal Skills and Teamwork in students.

CO3. Personal and Professional Development.

Course Content

UNIT I 8 HOURS

Intra, inter-personal and group communication skills. Gestures, postures, Proxemics, Kinesics. Listening to Lectures, Discussions, Talk Shows, News Programs.

UNIT II 7 HOURS

Conflict Resolution and Negotiation: Managing Conflicts through Effective Communication and Negotiation Techniques. Active listening, remaining calm, and finding mutually beneficial solutions.

UNIT III 8 HOURS

Assertiveness and Empathy: Developing Assertiveness Skills and Practicing Empathy in Communication. Expressing oneself confidently while respecting others' perspectives and feelings.

UNIT IV 8 HOURS

Group Discussions and Team Communication: Effective Participation in Group Discussions and Team Communication Strategies. Active listening, clear expression of ideas, and collaboration to achieve common goals.

Suggested Reading:

- Meena K and V. Ayothi (2013) *A Book on Development of Soft Skills*
- Alex K. (2012) *Soft Skills-Know Yourself & Know the World*
- Sofi, Naseer and Prof. Sunita Kumari. *Introduction to Phonetics and Grammar*, Narendara Publishing House. 2023

Web Sources

- <https://www.skillsyouneed.com/ips/communication-skills.html>
- https://owl.purdue.edu/owl/general_writing/index.html
- <https://www.mindtools.com/communication-skills>

Elective- I

Course Title: Disaster Risk Reduction and Management: Skills for Safety and Resilience	L	T	P	Cr.
Course Code: BCA3217	2	2	0	3

Total Hours:45**Course Outcomes:** At the end of the course, students will be able to:

- CO1. Identify hazards, vulnerabilities and risks at individual, institutional and community levels.
- CO2. Outline the legal and institutional frameworks of DRR in India and globally.
- CO3. Demonstrate life-saving skills, emergency communication, disaster response and risk mitigation techniques.
- CO4. Utilize and implement basic tools and technologies for risk assessment, preparedness and resilience-building.
- CO5. Prepare disaster management plans and design community awareness activities or prototypes in regional/local contexts.

Course Content**UNIT I****5 HOURS****Understanding Disaster Risk Reduction and Management**

- Basic concepts and terminology: Hazard, Vulnerability, Capacity, Exposure, Disaster, Risk, Disaster Management & Disaster Risk Reduction.
- Hazard profile of India: Regional profile.
- Disaster Management Cycle: Mitigation, preparedness, response, relief, recovery, rehabilitation.
- Policy and legal frameworks: DM Act 2005, DM Amendment Act 2025, National Policy, State-specific Acts; PM 10 Points agenda.
- International frameworks: Sendai Framework, Paris Agreement, SDGs.
- Role of Institutions in DRR (overview only): NDMA, NIDM, IMD, CWC, GSI, BIS, ISRO, INCOIS, SDMA, DDMA, NDRF.
- Case studies of different disasters in India: Lessons learned (minimum 2).

UNIT II**5 HOURS**

- Framework for Developing Disaster Management Plans.
- Hazard, Vulnerability, Capacity and Risk (HVCR) Assessment tools and techniques: Transect walk, Hazard mapping, Problem tree, Chapatti diagram etc.
- Mitigation and Preparedness: Evacuation planning, mock drills, tabletop exercises; disaster-specific mitigation, Crowd Management techniques.
- Basics of Incident Response System (IRS).
- Role of emergency forces: NDRF, SDRF, police, fire services, armed forces, NCC, NSS.
- Planning for more vulnerable groups.
- Emerging technologies: Drones, digital literacy, mobile apps (GIRI tool,

SAFAR, Meghdoot, UMANG, Sachet, CWC Flood Alerts, IMD, BIS, IHIP), social media for DRR.

- Basics of safe construction and structural & nonstructural audit exercise (safety of home/ college buildings).
- Funding mechanisms for disasters in India.
- Emergency Communication Network.

UNIT III

5 HOURS

Life-Saving Skills

- First Aid in disasters: Golden hour concept, CPR, wounds, choking, burns, fractures, animal bites (snake/dog/rabid), heat-related illnesses, triaging, stampede.
- Household and personal preparedness and protection: 72-hour emergency kit, safe food storage, water purification, ORS use, water sanitation and hygiene (WASH), and Infection Prevention Control (IPC) practices, Basic Sign Language.
- Search and Rescue methods.
- Fire safety and electrical/gas/LPG safety: Causes, prevention, fire extinguisher demonstration, indigenous methods (Natural first-aid remedies-aloe vera, turmeric, coconut oil, salt solution); traditional risk-reduction practices.
- Disaster-specific response: Floods, landslides, earthquakes, CBRN emergencies, pandemics, drowning, lightning, gas leakage, cyclone, heatwave, coldwave.
- Psychosocial support in DRR: Steps for implementing psychological first aid and its importance.
- Public health preparedness: Public health impacts of various disasters, Prevention of post-disaster water-borne and vector-borne diseases.

UNIT IV

30 HOURS

Field Exposure and Community Engagement

- Field visits: District Emergency Operations Centre, State Disaster Response Force/ National Disaster Response Force units, fire stations, State Emergency Operations Center, hazard-prone communities, heat-prone areas (flood-prone village, fire-vulnerable urban slum).
- Practical exposure: Mock drills, demonstrations and simulations (multi-hazard, evacuation, earthquake, flood); interaction with responders and officials (Aapda Mitras, National Cadet Corps/National Service Scheme/Nehru Yuva Kendra Sangathan, Red Cross).
- Community Engagement projects: Street, plays (nukkad natak), awareness campaigns, DRR clubs (institute and community level clubs), Information, Education and Communication material (podcasts, videos, comics, photo essays, posters, Knowledge exchange webinars).
- Environmental hazards: Youth/community participation (tree plantation, soil conservation).
- Project/assignment: Preparation of institutional/household DM plan in local language; budget-friendly multi-disaster survival kit prototype; reflective field report, youth-led community engagement projects and creation of IEC/digital communication materials. Multidisciplinary integration: Links with local governments, HEIs, youth/adolescent networks.
- Activities for mitigating disaster risks: Increasing green cover, plantation and

knowledge of human anatomy.

- Interaction with: State, district, gram panchayat level officials, DRR helpline numbers, and knowledge of physical resources required and available locally; interview/session with disaster survivors.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- The Sphere Project. (2018). *The Sphere handbook: Humanitarian charter and minimum standards in humanitarian response*. Sphere Association. <https://spherestandards.org/handbook/>
- World Health Organization. (2019). *Health emergency and disaster risk management framework (Health EDRM)*. World Health Organization. <https://www.who.int/publications/i/item/9789241516181>

Web Sources

- <https://ndma.gov.in/>
- <https://nidm.gov.in/>
- <https://www.undrr.org/sendai-framework-disaster-risk-reduction-2015-2030>

Course Title: Basics of Cyber Security	L	T	P	Cr.
Course Code: BCA3218	3	0	0	3

Total Hours: 45

Course Outcomes: On the completion of the course the students will be able to:

CO1: Understand the fundamentals of cyberspace and cyber security.

CO2: Analyse cybercrimes, cyber laws, and security threats.

CO3: Evaluate social media security and privacy practices.

CO4: Apply secure e-commerce and digital payment methods.

CO5: Implement cyber security tools and device protection techniques.

UNIT I**8 HOURS**

Introduction to Cyber security: Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.

UNIT II**12 HOURS**

Cyber-crime and Cyber law: Classification of cyber-crimes, Common cyber crimes cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies.

UNIT III**12 HOURS**

Social Media Overview and Security: Introduction to Social Networks. Types of social media, social media platforms, social media monitoring, hashtags, Viral content, social media marketing, social media privacy, Challenges, opportunities, and pitfalls in online social networks, Security issues related to social media, flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies

UNIT IV**13 HOURS**

E - Commerce, Digital Payments, Digital Devices Security, Tools and Technologies for Cyber Security: Definition of E- Commerce, Main components of E-Commerce, Elements of E- Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards,

Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorised banking transactions. Relevant provisions of Payment Settlement Act, 2007, End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Anti-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions

Suggested Readings

- Mishra, R. C. (2010). *Cyber crime impact in the new millennium*. Author Press.
- Belapure, S., & Godbole, N. (2011). *Cyber security: Understanding cyber crimes, computer forensics and legal perspectives* (1st ed.). Wiley India Pvt. Ltd.
- Oliver, H. A. (2001). *Security in the digital age: Social media security threats and vulnerabilities*. CreateSpace Independent Publishing Platform.
- Awad, E. M. (n.d.). *Electronic commerce*. Prentice Hall of India Pvt. Ltd.
- Kumar, K. (n.d.). *Cyber laws: Intellectual property & e-commerce security*. Dominant Publishers.
- Cole, E., Krutz, R., & Conley, J. W. (2009). *Network security bible* (2nd ed.). Wiley India Pvt. Ltd.
- Maiwald, E. (2004). *Fundamentals of network security*. McGraw-Hill Education.

Web Sources

- <http://www.csk.gov.in>
- <http://www.cert-in.org.in>
- <http://www.cybercrime.gov.in>

Course Title: Network Administration	L	T	P	Cr.
Course Code: BCA3208	0	0	6	3

Total Hours:90

Course Content

1. Provide knowledge of different concepts of network and system administration, configuration, and management.
2. Server/Client Installation over VMware Environment
3. Packet Analysis by using TCPDUMP and WIRESHARK 149
4. Network Practice with Packet Tracer
5. System Administration: User/Group management, File System Management
6. Network Configuration: Start/Stop network Service, network interface configuration
7. Firewall Configuration
8. DNS and DHCP Configuration and Troubleshooting
9. Web and Proxy Server Configuration and Troubleshooting
10. Basic Mail Server Configuration and Troubleshooting
11. SAMBA, NFS, CUPS and FTP configuration and Troubleshooting
12. SDN controller installation and client network implementation (OpenDaylight)
13. Network topology programming with Mininet and visualization

Web Sources

- <https://www.wireshark.org/docs/>
- <https://www.netacad.com/courses/packet-tracer>
https://docs.redhat.com/en/documentation/red_hat_enterprise_linux/

SEMESTER IV

Course Title: Programming using Java	L	T	P	Cr.
Course Code: BCA4250	3	0	0	3

Total Hours:30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Solve the computational problems using basic statements like if-else, control structures, array, and strings.
- CO2. Knowledge about the user requirements for software functionality in Java programming language.
- CO3. Apply basic principles of creating Java applications with Applet programming.
- CO4. Develop a given program using the basic elements like Control and Conditional statements.

Course Content**UNIT I****10 HOURS**

Introduction to Java: Introduction to java, Java History, Java Features; How Java Differs from C and C++; Comments in java, Java Program Structure, Implementing a Java Program, Java Virtual Machine, Command Line Arguments, Programming Style, Java and Internet, Java and World Wide Web, Web Browsers, Hardware and Software Requirements; Java Support Systems, Java Environment. Java Tokens; Java Statements.

UNIT II**15 HOURS**

Constants, Variables and Data Types: Introduction; Constants, Variables, Data Types, Introduction to Operators, Expressions, Operator Precedence. Decision Making, Branching and Looping: Decision making and branching Statements, Looping Statements, labeled loops, Jumping Statements.

UNIT III**10 HOURS**

Classes, Objects and Methods: Introduction, defining a Class, Data member, member function, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods, Arrays, Strings, Vectors: Arrays, Jagged Arrays, Strings, String functions: Vectors, Wrapper Classes, Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalizer Methods, Abstract Methods and Classes, Visibility Control.

UNIT IV**10 HOURS**

Interfaces: Introduction, Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables, Implementing Multiple Inheritance using Interfaces. Packages: Introduction; System Packages, Using System Packages, Naming Conventions, Creating Packages, accessing a Package, Using a Package, Adding a Class to a Package, Hiding Classes. Managing Errors and Exceptions: Introduction; Types of Errors; Exceptions, Exception Handling using Try, Catch

and Finally block: Throwing Our Own Exceptions, Using Exceptions for Debugging. Applet Programming: Introduction; How Applets Differ from Applications; Applet Life Cycle; Creating an Executable Applet.

Transactional Mode:

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Li, Y. (2022). *Computer Software Java Programming Optimization Design*. In International Conference on Frontier Computing (pp. 1086- 1092). Springer, Singapore.
- Liang, Y. D. (2003). *Introduction to Java programming*. Pearson Education India.
- Liang, Y. D. (2018). *Introduction to Java programming and data structures*. Pearson Education.
- Kavka, C. (2003, October). *Introduction to JAVA*. In Second Workshop on Distributed Laboratory Instrumentation Systems, ICTP, Trieste, Italy.

Web Sources

- <https://docs.oracle.com/javase/tutorial/>
- <https://www.geeksforgeeks.org/java/>
- <https://www.tutorialspoint.com/java/index.htm>

Course Title: Programming using Python	L	T	P	Cr.
Course Code: BCA4251	3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Understand the variables, expressions and statements.
- CO2. Apply conditional and looping constructs.
- CO3. Design and import functions in python programming.
- CO4. Learn Graphical User Interface using python.

Course Content

UNIT I 12 HOURS

A quick revision of the basics of python: Python operators, conditional statements (If, If-else, If-elif-else, Nested-if etc.) and loop control statements (for, while, Nested loops, Break, Continue, Pass statements). Functions and File handling. Concept of Modularization, Importance of modules in python, importing modules, Built in modules (ex: Numpy).

UNIT II 10 HOURS

Overview of NumPy: introduction to array computing and its advantages. Basic array operations: arithmetic operations, broadcasting Indexing and slicing: accessing and modifying array elements. Creating multidimensional arrays: understanding dimensions and axes.

UNIT III 11 HOURS

Introduction to Matplotlib: Overview of data visualization and importance of Matplotlib. Basics of Matplotlib: plot interface, creating line plots, scatter plots. Customizing plots: labels, colors, markers Plotting categorical data: bar plots, pie charts. Plotting quantitative data: histograms, box plots.

UNIT IV 12 HOURS

Overview of SQL: Structured Query Language for managing relational databases. Basic SQL commands: CREATE TABLE, INSERT INTO, SELECT, UPDATE, DELETE. Establishing database connection with python, creating databases and tables. Performing basic CRUD operations: inserting, querying, updating, and deleting data.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Matthes, E. (2023). *Python crash course: A hands-on, project-based introduction to programming* (3rd ed.). No Starch Press.
- Sweigart, A. (2019). *Automate the boring stuff with Python: Practical programming for total beginners* (2nd ed.). No Starch Press.
- Ramalho, L. (2022). *Fluent Python: Clear, concise, and effective programming* (2nd ed.). O'Reilly Media.

- Beazley, D., & Jones, B. K. (2013). *Python cookbook* (3rd ed.). O'Reilly Media.
- Slatkin, B. (2020). *Effective Python: 90 specific ways to write better Python* (2nd ed.). Addison-Wesley Professional.

Web Sources

- <https://docs.python.org/3/tutorial/>
- <https://numpy.org/doc/stable/>
- <https://matplotlib.org/stable/tutorials/index.html>

Course Title: Software Engineering	L	T	P	Cr.
Course Code: BCA4252	4	0	0	4

Total Hours: 60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Figure out the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction and deployment.
- CO2. Review the techniques of software lifecycle.
- CO3. Perform the various testing techniques.
- CO4. Prepare the Documentation of Software Requirement Analysis (SRS).

Course Content**UNIT I** **14 HOURS**

Software: Characteristics, Components, Applications Software Process Models: Waterfall, Spiral, Prototyping, Fourth Generation Techniques, Concepts of Project Management, Role of Metrics & Measurements.

UNIT II **16 HOURS**

S/W Project Planning: Objectives, Decomposition techniques: S/W Sizing, Problem based estimation, Process based estimation Cost Estimation Models: COCOMO Model, the S/W Equation.

UNIT III **14 HOURS**

System Analysis: Principles of Structured Analysis, Requirement analysis, DFD, Entity Relationship diagram, Data dictionary. S/W Design: Objectives, Principles, Concepts, Design methodologies: Data design, Architectural design, procedural design, Object oriented concepts

UNIT IV **16 HOURS**

Testing fundamentals: Objectives, principles, testability, Test cases: White box & Black box testing. Testing strategies: verification & validation, unit test, integration testing, validation testing, system testing

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Pressman S Roger (1992). *Software Engineering*, A Practitioner's Approach, Third Edition, McGraw Hill.
- Fairley E.R. (1985). *Software Engineering Concepts*, Mc Graw Hill.
- Jalota Pankaj (1992). *An Integrated Approach to Software Engineering*, Narosa Publishing House.

Web Sources

- <https://www.geeksforgeeks.org/software-engineering/>
- https://www.tutorialspoint.com/software_engineering/index.htm
- <https://www.ibm.com/topics/software-development-life-cycle>

Course Title: Programming using Java Lab	L	T	P	Cr.
Course Code: BCA4253	0	0	2	1

Total Hours:30

Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Discuss the concepts of object-oriented programming.
- CO2. Test the performance of Exception handling and multi-threading.
- CO3. Implementing and debugging the Java programs.
- CO4. Develop an Applet code using Java Programming.

Course Content

1. Introduction to JAVA, Class, Object, Package, Applet.
2. Write a Java program which does the creation of Class and object.
3. Usage of import statement and package declaration in Java programs.
4. Declaring variables of various data types and their effect by changing the access modifiers like private, public, protected, and default.
5. Write a program which makes use of Comparison Operators.
6. Write programs which make use of Arithmetic Operators.
7. Write a program which makes use of Logical Operators.
8. Write a program that makes use of control Statement like if, while, do while.
9. Write Java programs, which make use of Statements like Try, catch, finally.
10. Write a Java program, which makes use of control Statements like Try, catch, finally, throw, and throws.
11. Write code snippets which make usage of Method Overloading, Using super, this, super (), this () in Java Programs.
12. Write code snippets which make usage of method Overriding.
13. Write code snippets which make Applet.
14. Write code snippets which make usage of recursion.
15. Write code snippets which make usage of Thread.
16. Write code snippets which make usage of Thread Synchronization.
17. Write code snippets which make usage of String Methods.
18. Write code snippets which make usage of Swing Package.

Web Sources

- <https://docs.oracle.com/javase/tutorial/>
- <https://www.geeksforgeeks.org/java/>
- <https://www.tutorialspoint.com/java/index.htm>

Course Title: Programming using Python Lab	L	T	P	Cr.
Course Code: BCA4254	0	0	2	1

Total Hours: 30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Write, Test and Debug Python Programs.
- CO2. Implement Conditionals and Loops for Python Programs.
- CO3. Use functions and represent Compound data using Lists.
- CO4. Implement the basic conditional and looping constructs.

Course Content

1. Program to check whether a number is Even or Odd.
2. Program to find the largest among three numbers using nested if.
3. Program to check whether a year is Leap Year or not.
4. Program to print multiplication table of a given number using for loop.
5. Program to generate Fibonacci series using while loop.
6. Program to find the factorial of a number using a user-defined function.
7. Program to check whether a number is Prime or not using a function.
8. Program to create a calculator using functions (Addition, Subtraction, Multiplication, Division).
9. Program to write student information into a text file.
10. Program to read and display contents of a text file.
11. Program to create and use a custom module in Python.
12. Program to perform basic NumPy array creation and arithmetic operations.
13. Program to demonstrate NumPy broadcasting.
14. Program to perform indexing and slicing operations on a NumPy array.
15. Program to create and display a multidimensional NumPy array.
16. Program to create a line plot using Matplotlib.
17. Program to create a scatter plot with labels and markers using Matplotlib.
18. Program to create a bar chart and pie chart using Matplotlib.
19. Program to create a histogram and box plot using Matplotlib.
20. Program to connect Python with SQLite database and perform CRUD operations:
 - Create Database and Table
 - Insert Records
 - Display Records
 - Update Records
 - Delete Records

Web Sources

- <https://docs.python.org/3/tutorial/>
- <https://numpy.org/doc/stable/>
- <https://matplotlib.org/stable/tutorials/index.html>

Course Title: Minor Project	L	T	P	Cr.
Course Code: BCA4255	0	0	8	4

Course Description:

The Minor Project course in BCA provides students with the opportunity to apply their knowledge and skills acquired during their program to a practical project. The course allows students to work on a smaller-scale project under the guidance of faculty members to gain practical experience in software development, problem-solving, and project management.

Course Title: Indian Health Sciences	L	T	P	Cr.
Course Code: IKS0006	2	0	0	2

Total Hours:30

Course Learning Outcomes- After completion of this course, the learner will be able to:

CO1. Understand the basic concepts of health, wellness, and healthy lifestyle practices.

CO2. Explain the role of nutrients and balanced nutrition in maintaining human health.

CO3. Identify common communicable and lifestyle-related diseases and their prevention.

CO4. Assess nutritional status using BMI and dietary guidelines.

CO5. Recognize the importance of mental health, stress management, and well-being.

UNIT I**8 HOURS**

Fundamentals of health: Definition of health-WHO definition; Components of health- physical, social, mental, spiritual and its relevance. Concept of wellness. Health enhancing behaviors and their impacts on physiology: Exercise, Nutrition, Meditation, Yoga. Health compromising behaviors and their impacts on physiology: alcoholism, smoking.

UNIT II**8 HOURS**

Public Health and Nutrition: Macronutrients and Micronutrients; Functions, dietary sources and clinical manifestations of deficiency/ excess of the following nutrients: Carbohydrates, lipids and proteins; Fat soluble vitamins-A, D, E and K; Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin Important clinical manifestations of deficiency of minerals on human health: calcium, iron and iodine, Concept of Recommended Dietary Allowance (RDA), Adequate Intake (AI), Tolerable Upper Intake Level (UL), and Estimated Average Requirement (EAR), Determination and importance of BMI. Idea on overweight and obesity. Outline idea on Indian food pyramid.

UNIT III**8 HOURS**

Human health and diseases: Pathogens: Outline idea; introduction to parasites causing human diseases (dengue, amoebiasis, malaria, and ascariasis) and their control; Symptoms and treatment of these diseases. Drug and alcohol abuse in adolescence, Elementary idea on lifestyle disorders –Cerebrovascular Disease, Hypertension, cancer, Type 2 Diabetes, Chronic Obstructive Pulmonary Disease (COPD), Osteoarthritis, Osteoporosis, Cataracts.

UNIT IV**8 HOURS**

Mental health and well-being: Importance of Mental Health Awareness, Introduction to Anxiety, Stress, and Resilience; causes, symptoms and management of distress, Effects of Stress on Physical and Mental Health, Neurological disorders: Elementary idea on Parkinson's Disease, Dementia (Including Alzheimer's Disease), amyotrophic lateral sclerosis

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Reading:

- Park, K. (2023). *Park's textbook of preventive and social medicine* (27th ed.). Banarsidas Bhanot Publishers.
- Srilakshmi, B. (2018). *Nutrition science* (7th ed.). New Age International Publishers.
- Tortora, G. J., & Derrickson, B. H. (2021). *Principles of anatomy and physiology* (16th ed.). John Wiley & Sons.
- Carson, R. C., Butcher, J. N., Mineka, S., & Hooley, J. M. (2011). *Abnormal psychology and modern life* (13th ed.). Pearson Education.
- Gopalan, C., Sastri, B. V. R., & Balasubramanian, S. C. (2019). *Nutritive value of Indian foods*. National Institute of Nutrition.

Web Sources

- <https://www.who.int/health-topics>
- <https://www.cdc.gov/healthyliving/>
- <https://www.nimh.nih.gov/health/topics>

Course Title: Acquiring Business Communication-ABC	L	T	P	Cr.
Course Code: BCA4256	2	0	0	2

Total Hours: 30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. To improve the communicative competence of learners
- CO2. To help learners use language effectively in academic /work contexts
- CO3. To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- CO4. To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.
- CO5. To use language efficiently in expressing their opinions via various media.

Course Content

UNIT I 8 HOURS

Business Communication: Writing Business Reports and Proposals, Conducting Effective Business Meetings, Public Speaking, and Presentation Skills.

UNIT II 7 HOURS

Presentation Skills: Elements of effective presentation, structure of presentation, external factors and content, Seminar, Speeches, Lectures.

UNIT III 8 HOURS

Group Discussion: Structure of GD, Moderator led and other GDs, Strategies in GD, Team work body language, Mock GD, Problem solving, Reflective thinking, Critical thinking, Negotiation skills.

UNIT IV 7 HOURS

Effective Communication Skills: Handling Questions and Answers, Preparing for Q&A Sessions, and Responding Confidently to Questions. Strategies to anticipate and respond to queries, think critically on your feet, and deliver clear, concise, and confident responses, ultimately enhancing professional and public speaking skills.

Suggested Reading:

- Ghosh, B. N. (Ed.). (2012). *Managing soft skills for personality development*. McGraw Hill Education (India).
- Dhanavel, S. P. (2010). *English and soft skills*. Orient Blackswan.
- Pease, A., & Pease, B. (2004). *The definitive book of body language*. Manjul Publishing House.
- Lesikar, R. V., Flatley, M. E., & Rentz, K. (2011). *Basic business communication: Skills for empowering the Internet generation* (11th ed.). Tata McGraw-Hill Education.
- Navarro, J. (2009). *Louder than words: Take your career from average to exceptional with the hidden power of nonverbal intelligence*. HarperCollins Publishers.

- Khera, S. (2018). *You can win: A step-by-step tool for top achievers* (Revised ed.). Macmillan India Ltd.

Web Sources

- <https://www.skillsyouneed.com/presentation-skills.html>
- https://owl.purdue.edu/owl/general_writing/professional_technical_writing/index.html
- <https://www.mindtools.com/communication-skills-and-techniques.html>

Elective- II

Course Title: Theory of Computation	L	T	P	Cr.
Course Code: BCA4257	4	0	0	4

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Recognize and comprehend formal reasoning languages.
- CO2. Use basic concepts of formal languages of finite automata techniques
- CO3. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.
- CO4. Analyze Context Free languages, Expression and Grammars.

Course Content**UNIT I** **15 HOURS**

Introduction: Basic Terminology: Alphabet, Formal Language and operations on formal languages, Examples of formal languages.

Finite automata: Concept of Basic Machines, Properties and Limitations of Finite State Machines, Deterministic Finite Automata (DFA), Non- Deterministic Finite Automata (NFA), Equivalence of DFA and NDFA, Non- Deterministic Finite automata with Λ -Transitions.

UNIT II **15 HOURS**

Regular expression: Regular Languages and Regular Expressions, Kleen's Theorem. Arden's Method.

Properties of Regular sets: The Pumping Lemma for Regular sets, Application of the Pumping Lemma, Closure Properties of Regular Sets, Myhill- Nerode Theorem and Minimization of Finite Automata, Minimization Algorithm.

Finite Automata with output: Moore and Mealy Machines. Equivalence of Moore and Mealy Machines.

UNIT III **15 HOURS**

Context Free Grammars: Examples and Definitions, Derivation trees and ambiguity, An Unambiguous CFG for Algebraic Expressions. Regular Grammar, simplified forms and Normal forms: Removal of useless symbols and unit production, Removal of Λ -moves, Chomsky Normal Form (CNF), Griebach Normal Form (GNF).

Pushdown Automata: Introduction and Definition of Push-Down Automaton, Applications of Push down Automata

UNIT IV **15 HOURS**

Turing Machines: Definitions and Examples, Deterministic and Non- Deterministic Turing Machines, Unsolvability Problems: A Non-recursive Language and an Unsolvability Problem, PCP Problem and MPCP Problem. More General Languages and Grammars: Recursively Enumerable and Recursive Languages, Unrestricted grammars, Context sensitive Language and grammar. Relation between languages of classes, Chomskierarchies of grammars.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Sipser, M. (2012). *Introduction to the theory of computation* (3rd ed.). Cengage Learning.
- Kozen, D. C. (2006). *Theory of computation*. Springer.
- Martin, J. C. (2010). *Introduction to languages and the theory of computation* (4th ed.). McGraw-Hill Higher Education.

Web Sources

- <https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/>
- https://www.tutorialspoint.com/automata_theory/index.htm
- <https://ocw.mit.edu/courses/18-404j-theory-of-computation-fall-2020/>

Course Title: Big Data	L	T	P	Cr.
Course Code: BCA4258	4	0	0	4

Total Hours: 60

Course Learning Outcomes: After completion of this course, the learner will be able to:

CO1. Discuss the building blocks of Big Data.

CO2. Articulate the programming aspects of cloud computing.

CO3. Represent the analytical aspects of Big Data.

CO4. Knowledge about the recent research trends related to Hadoop File System, Map Reduce and Google File System etc.

Course Content

UNIT I

15 HOURS

Introduction to Big Data: Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis Vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re- Sampling - Statistical Inference - Prediction Error

UNIT II

15 HOURS

Mining Data Streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing - Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real Time Analytics Platform (RTAP) Applications, Case Studies: Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III

15 HOURS

Hadoop Environment: History of Hadoop- The Hadoop Distributed File System: Components of Hadoop- Analyzing the Data with Hadoop, Scaling Out- Hadoop Streaming, Design of HDFS-Hadoop file systems- Java interfaces to HDFS- Basics- Developing a Map Reduce Application- How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures: Job Scheduling-Shuffle and Sort, Task execution, Map Reduce Types and Formats- Map Reduce Features - Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop

UNIT IV

15 HOURS

Data Analysis Systems and Visualization: Link Analysis – Page Rank - Efficient Computation of Page Rank- Topic-Sensitive Page Rank – Link Spam-Recommendation Systems- A Model for Recommendation Systems- Content-Based Recommendations - Collaborative Filtering- Dimensionality Reduction- Visualizations - Visual data analysis techniques-interaction techniques- Systems and applications.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Eaton, C., DeRoos, D., Deutsch, T., Lapis, G., & Zikopoulos, P. (2012). *Understanding big data: Analytics for enterprise class Hadoop and streaming data*. McGraw-Hill Education.
- White, T. (2012). *Hadoop: The definitive guide* (3rd ed.). O'Reilly Media.
- Hurwitz, J., Nugent, A., Halper, F., & Kaufman, M. (2013). *Big data for dummies*. John Wiley & Sons.

Web Sources

- <https://hadoop.apache.org/docs/>
- https://www.tutorialspoint.com/big_data_analytics/index.htm
- <https://www.ibm.com/topics/big-data-analytics>

Course Title: Embedded Systems	L	T	P	Cr.
Course Code: BCA4259	4	0	0	4

Total Hours:60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. The issues relating to hardware and software design concepts associated with processor in Embedded Systems.
- CO2. The concept of low power microcontrollers.
- CO3. The hardware software co- design issues pertaining to design of an Embedded System using low power microcontrollers.

Course Content

UNIT I

15 HOURS

An Embedded System-Definition, Embedded System Design and Development Life Cycle, An Introduction to Embedded system Architecture, The Embedded Systems Model, Embedded Hardware: The Embedded Board and the von Neumann Model, Embedded Processors: ISA Architecture Models, Internal Processor Design, Processor Performance, Board Memory: Read-Only Memory (ROM), Random-Access Memory (RAM), Auxiliary Memory, Memory Management of External Memory and Performance, Approaches to Embedded Systems, Small Microcontrollers, Anatomy of a Typical Small Microcontroller, Small Microcontrollers Memory, Embedded Software, Introduction to small microcontroller (MSP430).

UNIT II

15 HOURS

Architecture of the MSP430 Processor: Central Processing Unit, Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Examples, Reflections on the CPU and Instruction Set, Resets, Clock System, Memory and Memory Organization.

Functions, Interrupts, and Low-Power Mode: Functions and Subroutines, Storage for Local Variables, Passing Parameters to a Subroutine and Returning a Result, Mixing C and Assembly Language, Interrupts, Interrupt Service Routines, Issues Associated with Interrupts, Low-Power Modes of Operation.

UNIT III

15 HOURS

Digital Input, Output, and Displays: Parallel Ports, Digital Inputs, Switch Debounce, Digital Outputs, Interface between Systems, Driving Heavier Loads, Liquid Crystal Displays, Simple Applications of the LCD.

Timers: Watchdog Timer, Timer_A, Timer_A Modes, Timer_B, Timer_B Modes, Setting the Real-Time Clock, State Machines.

UNIT IV

15 HOURS

Communication Peripherals in the MSP430, Serial Peripheral Interface, SPI with the USI, SPI with the USCI, A Thermometer Using SPI Modes, Inter-integrated Circuit Bus (I²C) and its operations, State Machines for I²C Communication, A Thermometer Using I²C, Asynchronous Serial Communication, Asynchronous Communication with the USCI_A, A Software UART Using Timer_A, Other Types of Communication.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Reading:

- Noergaard, T. (2005). *Embedded systems architecture: A comprehensive guide for engineers and programmers*. Elsevier.
- Davies, J. H. (2008). *MSP430 microcontroller basics*. Newnes/Elsevier.
- Jiménez, M., Palomera, R., & Couvertier, I. (2014). *Introduction to embedded systems: Using microcontrollers and the MSP430*. Springer.
- Vahid, F., & Givargis, T. D. (2002). *Embedded system design: A unified hardware/software introduction*. John Wiley & Sons.
- Marwedel, P. (2007). *Embedded system design*. Springer.
- Burger, A. S. (2002). *Embedded system design*. CMP Books.
- Rajkamal. (2008). *Embedded systems: Architecture, programming and design* (2nd ed.). Tata McGraw-Hill.

Web Sources

- <https://www.ti.com/document-viewer/lit/html/slau144>
- <https://www.geeksforgeeks.org/embedded-systems-tutorial/>
- https://www.tutorialspoint.com/embedded_systems/index.htm

Semester V

Course Title: Artificial Intelligence	L	T	P	Cr.
Course Code: BCA5300	4	0	0	4

Total Hours:60

Course Learning Outcomes: After completion of this course, the learner will be able to:

CO1. Identify problems that are amenable to solution by specific AI methods

CO2. Represent knowledge in Prolog and write code for drawing inferences.

CO3. Identify appropriate AI technique for the problem at hand

CO4. Compare strengths and weaknesses of different artificial Intelligence techniques.

Course Content**UNIT I****15 HOURS**

Introduction: Introduction to artificial intelligence, background and applications, Turing test, rational agents, intelligent agents, structure, behavior and environment of intelligent agents.

UNIT II**15 HOURS**

Knowledge Representation: Propositional logic, first order predicate logic, resolution principle, unification, semantic nets, conceptual dependencies, frames, scripts, production rules, conceptual graphs.

UNIT III**15 HOURS**

Problem Solving and Searching Techniques: Problem characteristics, production systems, control strategies, breadth first search, depth first search, hill climbing and its variations, heuristics search techniques: best first search, A* algorithm, constraint satisfaction problem, means- end analysis.

Ethics in AI, Fairness in AI, Legal perspective

UNIT IV**15 HOURS**

Game Playing: introduction to game playing, min-max and alpha-beta pruning algorithms.

Prolog Programming: Introduction to Programming in Logic (PROLOG), Lists, Operators, basic Input and Output.

Transactional modes

Project based learning, Team Teaching, Flipped teaching, Open talk, Collaborative Teaching, Case Analysis, Panel Discussions, Group Discussions.

Suggested Readings

- Winston, P. H. (1984). *Artificial intelligence* (2nd ed.). Addison-Wesley Publishing Company.
- Winston, P. H. (1992). *Artificial intelligence* (3rd ed.). Addison-Wesley Publishing Company.
- Boden, M. A. (Ed.). (1996). *Artificial intelligence*. Academic Press.
- Hunt, E. B. (2014). *Artificial intelligence*. Academic Press.

Web Sources

- <https://www.geeksforgeeks.org/artificial-intelligence-tutorial/>
- https://www.tutorialspoint.com/artificial_intelligence/index.htm
- <https://www.swi-prolog.org/pldoc/>

Course Title: Computer Graphics	L	T	P	Cr.
Course Code: BCA5301	4	0	0	4

Total Hours: 60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Describe Standard raster and vector scan devices as well as Graphical Input and output devices.
- CO2. Implement algorithms for drawing basic primitives such as line circle and ellipse.
- CO3. Implement algorithms for line clipping and polygon clipping and filing.
- CO4. Implement a 3D object representation scheme and carry out 2D and 3D Transformation, 3D projections.

Course Content

UNIT I

15 HOURS

Introduction: Introduction to Graphics systems, Basic elements of Computer graphics, Applications of computer graphics.

Input devices: Keyboard, Touch panel, light pens, Graphic tablets, Joysticks, Trackball, Data glove, Digitizers, Image scanner, Mouse, Voice & Systems.

Hard copy devices: Impact and non-impact printers, such as line printer, dot matrix, laser, ink, jet, electrostatic, flatbed and drum plotters.

UNIT II

15 HOURS

Video Display Devices: Refresh cathode ray tube, raster scan displays, random scan displays, color CRT, monitors, direct view storage tube, flat, panel displays; 3,D viewing devices, raster scan systems, random scan systems, graphics monitors and workstations.

Scan conversion algorithms for line, circle and ellipse, Bresenham's algorithms, area filling techniques, character generation.

UNIT II

15 HOURS

2D Graphics: Cartesian and Homogeneous coordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Two-dimensional viewing transformation and clipping (line, polygon, and text).

UNIT IV

15 HOURS

3D Graphics: Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Mathematics of Projections (parallel & perspective). 3,D viewing transformations and clipping.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Hearn, D., & Baker, M. P. (2004). *Computer graphics with OpenGL* (3rd ed.). Pearson Prentice Hall.
- Foley, J. D., Van Dam, A., Feiner, S. K., Hughes, J. F., & Phillips, R. L. (1994). *Introduction to computer graphics*. Addison-Wesley.
- Shirley, P., Ashikhmin, M., & Marschner, S. (2009). *Fundamentals of computer graphics* (3rd ed.). AK Peters/CRC Press.
- Foley, J. D., Van Dam, A., Feiner, S. K., Hughes, J. F., & Hughes, J. (1996). *Computer graphics: Principles and practice* (2nd ed.). Addison-Wesley Professional.

Web Sources

- <https://www.geeksforgeeks.org/computer-graphics-tutorials/>
- https://www.tutorialspoint.com/computer_graphics/index.htm
- <https://nptel.ac.in/courses/106106090/>

Course Title: Artificial Intelligence Lab	L	T	P	Cr.
Course Code: BCA5302	0	0	4	2

Total Hours :60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Apply Prolog programming concepts to solve basic logical and mathematical problems.
- CO2. Understand and implement recursive techniques in Prolog for problem-solving.
- CO3. Use Prolog to perform mathematical computations and algorithmic operations.
- CO4. Develop skills in list processing and manipulation using Prolog predicates.

Course Content

1. Write a prolog program to calculate the sum of two numbers.
2. Write a Prolog program to implement max(X, Y, M) so that M is the maximum of two numbers X and Y.
3. Write a program in PROLOG to implement factorial (N, F) where F represents the factorial of a number N.
4. Write a program in PROLOG to implement generate_fib(N,T) where T represents the Nth term of the Fibonacci series.
5. Write a Prolog program to implement GCD of two numbers.
6. Write a Prolog program to implement power (Num,Pow, Ans) : where Num is raised to the power Pow to get Ans.
7. Prolog program to implement multi (N1, N2, R) : where N1 and N2 denotes the numbers to be multiplied and R represents the result.
8. Write a Prolog program to implement memb(X, L): to check whether X is a member of L or not.
9. Write a Prolog program to implement conc (L1, L2, L3) where L2 is the list to be appended with L1 to get the resulting list L3.
10. Write a Prolog program to implement reverse (L, R) where List L is original and List R is reversed list.
11. Write a program in PROLOG to implement palindrome (L) which checks whether a list L is a palindrome or not.
12. Write a Prolog program to implement sumlist(L, S) so that S is the sum of a given list L. Write a Prolog program to implement two predicates evenlength(List) and oddlength(List) so that they are true if their argument is a list of even or odd length respectively.
13. Write a Prolog program to implement nth_element (N, L, X) where N is the desired position, L is a list and X represents the Nth element of L.
14. Write a Prolog program to implement maxlist(L, M) so that M is the maximum number in the list.
15. Write a prolog program to implement insert_nth (I, N, L, R) that inserts an item I into the Nth position of list L to generate a list R.
16. Write a Prolog program to implement delete_nth (N, L, R) that removes the

element on Nth position from a list L to generate a list R.

17. Write a program in PROLOG to implement merge (L1, L2, L3) where L1 is first ordered list and L2 is second ordered list and L3 represents the merged list.

Web Sources

- <https://www.swi-prolog.org/pldoc/>
- <https://www.tutorialspoint.com/prolog/index.htm>
- <https://www.geeksforgeeks.org/prolog-an-introduction>

Course Title: Computer Graphics Lab	L	T	P	Cr.
Course Code: BCA5303	0	0	4	2

Total Hours:60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Apply mathematics and logic to develop Computer programs for elementary graphic operations
- CO2. Implement the Flood Fill Algorithm.
- CO3. Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics
- CO4. Develop the competency to understand the concepts related to Computer Vision and Virtual reality

Course Content

1. Write a program to plot a pixel.
2. Write a Program to Draw a Line.
3. Write a Program to Draw a Circle.
4. Write a program to draw an ellipse.
5. Write a program to draw arc.
6. Write a program to illustrate the functions setfillstyle(), setcolor(), setbkcolor(), floodfill() using inbuilt functions
7. Write a program to draw a HUT using various inbuilt functions.
8. Write a program to draw a line by using a direct method algorithm.
9. Program to Implement DDA Line Algorithm.
10. Draw a Line Using 'Bresenham's Line Algorithm'.
11. Draw a Circle Using 'Bresenham's Circle Drawing Algorithm'.
12. Write a program to draw a Circle by using the Polynomial Method.
13. Write a Program for Flood Fill Algorithms.
14. Write a program to implement 2D Translation.
15. Write a program to implement 2D Scaling.
16. Write a program to implement 2D Rotation about origin
17. Mini Project:-Moving Car

Web Sources

- <https://www.geeksforgeeks.org/computer-graphics-tutorials/>
- https://www.tutorialspoint.com/computer_graphics/index.htm
- <https://nptel.ac.in/courses/106106090/>

Course Title: Indian Education	L	T	P	Cr.
Course Code: IKS0002	2	0	0	2

Total Hours:30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Understand development of education and their historical importance in India.
- CO2. To know about the education system in ancient era, buddha era their relation and knowledge.
- CO3. To understand the commission for development of education, committee and their importance.
- CO4. To understand the problems about education.

Course Content**UNIT I****7 HOURS**

Education in Vedic Period, Buddhist period and its characteristics and importance of present time. Education system in medieval period its importance, main education center and important factors.

UNIT II**8 HOURS**

Education in colonial period charter act 1813, Qorientat accidental education controversy Macaulays Minutes, wood dispatch Hunter commission, Gokhle's bill, sadler commission, Vardha Scheme of Education and Sargent plan.

UNIT III**8 HOURS**

University education commission (1948-49), Secondary education commission (1952-53), education commission (1964-66), National policy of education (1986) Revised Policy of Education, University education commission (1948-49), Secondary education commission (1952-53), education commission (1964-66), National policy of education (1986) Revised Policy of Education (1992) and their importance.

UNIT IV**7 HOURS**

Universlization of Primary education Vocationalisation of Secondary Education, Student peace and balance in education occausion.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Aggarwal, J. C. (n.d.). *Landmarks in the history of modern Indian education*. Vikas Publishing House.
- Mitra, S. K. (n.d.). *Education in ancient India*. Asha Jyoti Book Sellers.
- Mukherjee, S. N. (n.d.). *History of education in India: Modern period*. Acharya Book Depot.
- Keay, F. E. (n.d.). *Indian education in ancient and later times*. Oxford University Press.

- Sharma, R. A. (n.d.). *Development of educational system in India*. R. Lall Book Depot.

Web Sources

- <https://www.nios.ac.in/media/documents/dled/Block-1.pdf>
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=25>
- <https://www.education.gov.in/en/national-education-policy-2020>

Course Title: Internship Training	L	T	P	Cr.
Course Code: BCA5304	0	0	8	4

Course Description:

The Internship Training program in BCA provides students with a hands-on learning experience by working in real-world industry settings. It aims to bridge the gap between academic knowledge and practical application, allowing students to gain valuable industry exposure, apply their skills, and develop a deeper understanding of their chosen field.

Course Title: Basics of Android App Development	L	T	P	Cr.
Course Code: BCA5305	2	0	0	2

Total Hours:30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Identify various concepts of mobile programming that make it unique from programming for other platforms, Critique mobile applications on their design pros and cons.
- CO2. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
- CO3. Program mobile applications for the Android operating system that use basic and advanced phone features.
- CO4. Deploy applications to the Android marketplace for distribution.

UNIT I**8 HOURS**

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT II**7 HOURS**

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT III**8 HOURS**

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation. Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT IV**7 HOURS**

Using Common Android APIs: Using Android Data and Storage APIs, managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Reading:

- Darcey, L., & Conder, S. (2011). *Android wireless application development* (2nd ed.). Pearson Education.
- Meier, R. (2010). *Professional Android 2 application development*. Wiley India Pvt. Ltd.

- Murphy, M. L. (2010). *Beginning Android*. Wiley India Pvt. Ltd.
- Burd, B. (2012). *Android application development all-in-one for dummies*. John Wiley & Sons.

Web Sources

- <https://developer.android.com/docs>
- <https://developer.android.com/training/basics/firstapp>
- <https://www.geeksforgeeks.org/android-tutorial/>

Course Title: Basics of Android App Development Lab	L	T	P	Cr.
Course Code: BCA5306	2	0	0	2

Total Hours:30**Course Content**

1. Installation of Android studio.
2. Development Of Hello World Application.
3. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
4. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout).
5. Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity.
6. Design an android application Send SMS using Intent.
7. Create an android application using Fragments.
8. Design an android application Using Radiobuttons.
9. Design an android application for menu.
10. Create a user registration application that stores the user details in a database table.

Web Sources

- <https://developer.android.com/studio/install>
- <https://developer.android.com/training/basics/firstapp>
- <https://www.geeksforgeeks.org/android-tutorial/>

Course Title: Search Engine Optimization-	L	T	P	Cr.
Course Code: BCA5307	2	0	0	2

Total Hours:30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Identify how to optimize on-page elements including titles, meta descriptions, page headings and body copy.
- CO2. Create a content marketing strategy to support SEO and link acquisition.
- CO3. Applying skills needed to attempt Google Ads Certifications
- CO4. Apply Google Analytics and other metrics and tools to monitor progress in achieving search engine marketing goals.

Course Content

UNIT I 8 HOURS

Search Engine Periodic Table, Search Engine Heat Map, and Search Engine on Page SEO factors. Internet Business Promoter (IBP) SEO software installation. Testing Pages for ON PAGE SEO factors using SEO analysis tools i.e. IBP SEO software. Traffic Travis SEO Analysis, On-Page Factors, Originality & Fresh Content, Writing for Humans, SEO Analysis, Images Optimization. Types of Google Ads campaigns. Understanding various types of Google Ads campaigns, Ads Account Limits.

UNIT II 7 HOURS

IP Address Exclusion, Guideline of Google ads, what is CTR, Impression, CPC. The elements of a search ad, Targeting options, bidding and ranking for search ads, Tracking, Use the Google Ads Editor to Manage Your Ads and Keywords.

UNIT III 8 HOURS

Hours Introduction, what is pay –per click? Key terms and concepts, advertising in search, difference between search and display campaign, recent update in ads, account structure in ads The Benefits of PPC in the Purchase Phase Set Up the Search and Content Networks, Keyword Research, Trademarks and Keywords.

UNIT IV 7 HOURS

Search Engine Marketing (SEM, Creating the Ad Groups, Naming the Ad Groups, Writing the Ads Competitors' Bids, The Quality Score, The Ad Rank Score, Manual Bid Management, Automated Bid Management, Creating reports for Google Ads.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching.

Suggested Readings:

- Das, S. (2021). *Search engine optimization and marketing: A recipe for success in digital marketing*. CRC Press.
- Zilincan, J. (2015). Search engine optimization. In *CBU International Conference Proceedings* (Vol. 3, pp. 506–510).
- Shahzad, A., Jacob, D. W., Nawi, N. M., Mahdin, H., & Saputri, M. E. (2020). The new trend for search engine optimization, tools and techniques.

Indonesian Journal of Electrical Engineering and Computer Science, 18(3), 1568–1583. <https://doi.org/10.11591/ijeecs.v18.i3.pp1568-1583>

- Flipped teaching, collaborative learning. (*Suggested reading / pedagogical approach — not a formal bibliographic source*)

Web Sources

- <https://support.google.com/google-ads/>
- <https://www.wordstream.com/google-ads>
- <https://www.semrush.com/blog/google-ads/>

Semester VI

Title: Machine Learning	L	T	P	Cr.
Course Code: BCA6350	3	0	0	3

Total Hours:45

Course Learning Outcomes: After completion of this course, the learner will be able to:

CO1. Describe the basic concepts of Bayesian Decision Theory.

CO2. Implement the working of perceptron learning algorithm, criterion and Windrow-Hoff learning algorithm.

CO3. Depict the algorithms like Nearest Neighbor classification, K-nearest neighbor and their applications.

CO4. Evaluate the models generated from data.

Course Content**UNIT I****10 HOURS**

Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions, Examples of classifiers bayes optimal classifier and error, learning classification approaches.

UNIT II**15 HOURS**

Linear machines: General and linear discriminates, decision regions, single layer neural network, linear separability, general gradient descent, perceptron learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer, Perceptron: two-layers universal approximates, back propagation learning, on-line, off-line error surface, important parameters.

UNIT III**10 HOURS**

Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous testnodes, confidence, pruning, learning with incomplete data case, VC-dimension, fundamental algorithm independent concepts.

UNIT IV**10 HOURS**

Machine learning concepts and limitations: Learning theory, formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, Occam's razor, empirical risk, limitations of inference machines, approximation and estimation errors, Trade Offs.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Alpaydin, E. (2020). *Introduction to machine learning*. MIT Press.
- Jordan, M. I., & Mitchell, T. M. (2015). Machine learning: Trends, perspectives, and prospects. *Science*, 349(6245), 255–260.
<https://doi.org/10.1126/science.aaa8415>
- Mitchell, T. M. (1997). *Machine learning*. McGraw-Hill.
- Bishop, C. M., & Nasrabadi, N. M. (2006). *Pattern recognition and machine learning*. Springer.

Web Sources

- <https://scikit-learn.org/stable/tutorial/index.html>
- <https://www.geeksforgeeks.org/machine-learning/>
- <https://www.ibm.com/topics/machine-learning>

Course Title: CLOUD COMPUTING	L	T	P	Cr.
Course Code: BCA6351	4	0	0	4

Total Hours:60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Explain the fundamentals, characteristics, components, and evolution of cloud computing and its service delivery model.
- CO2. Analyze the architectural foundations, benefits, limitations, security concerns, and regulatory issues associated with cloud computing.
- CO3. Differentiate between SaaS, PaaS, IaaS, and various cloud deployment models, and evaluate their advantages and challenges.
- CO4. Apply CloudSim and GreenCloud simulators to model, analyze, and evaluate cloud computing environments.

Course Content**UNIT I****15 HOURS**

Origins of Cloud computing: Cloud components, Essential characteristics, On-demand self- service, Broad network access, Location independent resource pooling, Rapid elasticity, measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT II**15 HOURS**

Architectural influences: High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability, simplicity, vendors, security, Limitations: Sensitive information, Application development, security level of third party, security benefits, Regularity issues: Government policies.

UNIT III**15 HOURS**

Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds, Private clouds, Community clouds, Hybrid clouds, Advantages of Cloud computing.

UNIT IV**15 HOURS**

Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture (User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud.

Basics of VMWare, advantages of VMware virtualization, using VMware workstation, creating virtual machines- understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Reading:

- Velte, A. T., Velte, T. J., & Elsenpeter, R. (2010). *Cloud computing: A practical approach*. Tata McGraw-Hill.
- Miller, M. (2008). *Cloud computing: Web-based applications that change the way you work and collaborate online*. Que Publishing.
- Hurwitz, J., Bloor, R., Kaufman, M., & Halper, F. (2010). *Cloud computing for dummies*. Wiley Publishing.
- Buyya, R., Broberg, J., & Goscinski, A. (Eds.). (2011). *Cloud computing: Principles and paradigms*. John Wiley & Sons.

Web Sources

- <https://aws.amazon.com/what-is-cloud-computing/>
- <https://azure.microsoft.com/en-us/resources/cloud-computing-dictionary/what-is-cloud-computing/>
- <https://www.geeksforgeeks.org/cloud-computing/>

Course Title: Information Security	L	T	P	Cr.
Course Code: BCA6352	3	0	0	3

Total Hours: 45

Course Learning Outcomes: After completion of this course, the learner will be able to:

CO1. Knowledge about management aspects of information security.

CO2. Should be able to summarize security risk and associated assessment models like COBIT.

CO3. Should distinguish proactive security mechanisms, like firewalls, IDS/IPS etc and application audit methodology.

CO4. Demonstrate various security standardization and legal issues involving information security.

Course Content

UNIT I

10 HOURS

Information Security Management: Why Information Security Matters, Information Sensitivity Classification, Information Security Governance, The Computing Environment Security of Various Components in the Computing Environment, Security Interdependence, CIA Triad, Security Goals versus Business Goals, The Security Star, Parker's View, Defence-In-Depth Security, Security Control, NSA Triad Introduction to Management Concepts: History, Managerial Skills, Mintzberg's Managerial Role, Strategic Management Concepts, IS Security Management Activities, The Information Security Management Cycle, IS Security Management versus Functional Management

UNIT II

15 HOURS

Life Cycle and Plan: The Information Security Life Cycle, Security Planning in the SLC, Security Analysis, Security Design, Security Implementation, Security Review - Continual Security, Security Plan, SP Development Guidelines, analysis, methodology, Security Plan : Security Policy, Standards, and Guidelines, Methodologies: on Computing Environment Partition - on Computing Boundaries - Benson's Security Policy Methodology - Business Continuity Planning: Business Disruptions - Business Continuity - Disaster Recovery - Responding to Business Disruptions - Developing a BCP

UNIT III

10 HOURS

Security Analysis and Design: Security Risk Management, Various Layers of Risk, The Risk Management Life Cycle, The Preparation Effort for Risk Management, A Sustainable Security, Information Needed to Manage Risks, Factors Affecting Security Risk, The ALE Risk Methodology - Operational, Functional, and Strategic Risks, Operational Risk Management: Naval Safety, The ABLE Methodology, (IFEAR) IFEAR Methodology, Fault Tree Analysis, Event Tree Analysis, FTA-ETA Integration, Risk Management, History - ISO/IEC 27002, Enhance Security Measurement and Implementations - Enhance the ISO/IEC 27002-Based Security Posture, Technical Security Enhancement Based on ISO/IEC 27001-

Organizations Interact with the Standards, General ISMS Framework, Model, The Process Approach, Development, Design, Security Inventory Needs, Integration, Self-Assessment for Compliance, Scoping, Security Implementation

UNIT IV

10 HOURS

Different Things to Different People: Audit Activities, Definition, Main Features, Application Audit, Relating to Corporate Security Policy, Structure, Security Audit versus IT Auditing, Applicable Security, Related Standards, Security Audit Grades, The Problem of Privacy, The Meaning of Privacy, HIPAA, The Privacy Rule, The HIPAA Security Rule, Administrative Safeguards, NIST on HIPAA, Conducting Effective Risk Analysis, Methods of Doing Business, Background of the Sarbanes, Oxley Act, Sarbanes, Oxley Act of 2002, Major Provisions of Management Assessment, IT Compliance, International Responses, Advantages to SOX Compliance, Foreign Whistle blowers and SOX, Reconciling SOX and European Conflicting Standards, EU Corporate Governance Initiatives, E.U.'s Eighth Directive, Planning IT Management for SOX: Delayed SOX Impact. Security Economic Intelligence, Homeland Security, Cyber terrorism in the Literature, Cyber terrorism in the Real World: The FBI Perspective, U.S. Legislative Enactments and Proposed Programs, U.S. Criminal Statutes Affecting the Internet, Statutes and Executive Orders Concerned with Cyber terrorism, International Initiatives, Individual European State Approaches to Security and Counterterrorism.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Reading:

- Raggad, B. G. (n.d.). *Information security management: Concepts and practice*. CRC Press.
- Godbole, N. (2009). *Information systems security: Security management, metrics, frameworks and best practices*. Wiley India Pvt. Ltd.
- Whitman, M. E., & Mattord, H. J. (2014). *Management of information security* (4th ed.). Cengage Learning.
- Whitman, M. E., & Mattord, H. J. (2015). *Principles of information security* (5th ed.). Cengage Learning.
- Tipton, H. F. (2012). *Information security management handbook* (6th ed.). CRC Press.
- Peltier, T. R. (2004). *Information security policies and procedures* (2nd ed.). Auerbach Publications.

Web Sources

- <https://www.nist.gov/cyberframework>
- <https://www.cisa.gov/cybersecurity>
- <https://www.iso.org/isoiec-27001-information-security.html>

Course Title: MACHINE LEARNING LAB	L	T	P	Cr.
Course Code: BCA BCA6353	0	0	2	1

Total Hours:30

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Understand the Basic operations of Linear Algebra in Machine Learning.
- CO2. Use various Supervised Learning techniques like Linear Regression and Nonlinear Regression.
- CO3. Apply Statistical approaches for multiple Learning techniques.
- CO4. Construct models for Classification.
- CO5. Build neural network models.

Course Content

1. Write a Program to perform the following operations on matrices
 - a. Matrix addition
 - b. Matrix Subtraction
 - c. Matrix Multiplication
 - d. Matrix Inversion
 - e. Transpose of a Matrix
2. Write a Program to perform the following operations
 - a. Find the minimum and maximum element of the matrix
 - b. Find the minimum and maximum element of each row in the matrix
 - c. Find the minimum and maximum element of each column in the matrix
 - d. Find trace of the given matrix
 - e. Find rank of the given matrix
 - f. Find eigenvalues and eigenvectors of the given matrix
3. Write a Program to find the mean, median, standard deviation and mode using user defined functions.
4. Create a data frame with columns at least 5 observations
 - a. Retrieve a particular column from the DataFrame
 - b. Summarize the data frame and observe the statistics of the DataFrame created
 - c. Observe the mean and standard deviation of the data frame and print the values.
5. Write a program to implement the Linear Regression for a sample training data set stored as a .CSV file. Compute Mean Square Error by considering few test data sets.
6. Write a program to implement the Non-linear Regression for a sample training data set stored as a .CSV file. Compute Mean Square Error by considering few test data sets.
7. Write a program to implement the Logistic Regression for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier.
8. Write a program to implement the naïve Bayesian classifier for a sample

training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

10. Write a program to implement Support Vector Machine algorithm to classify the iris data set. Print both correct and wrong predictions.

11. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

12. Write a program to demonstrate the working of the decision tree based CART algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

13. Write a program to construct a Regression tree for cost estimation by assuming any numerical dataset.

14. Write a program to calculate the accuracy, precision, and recall for your data set. Assume a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task.

15. Implement a single neural network and test for different logic gates.

16. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

17. Backpropagation algorithm and test the same using appropriate data sets.

Web Sources

1. https://scikit-learn.org/stable/supervised_learning.html
2. <https://numpy.org/doc/stable/user/quickstart.html>
3. https://pandas.pydata.org/docs/user_guide/index.html

Course Title: MAJOR PROJECT LAB	L	T	P	Cr.
Course Code: BCA6354	0	0	8	4

Total Hours:120

Course Learning Outcomes: After completion of this course, the learner will be able to:

CO1. Update oneself with all the latest changes in the technological world.

CO2. Become master in one's specialized technology.

CO3. Analyze and understand the environment of the organization.

CO4. Develop to cognizance of the importance of management principles

Course Content

1. Starting of Major Project (Feasibility Study, Requirement Analysis, Design)

Course Title: Digital Marketing	L	T	P	Cr.
Course Code: BCA6355	2	0	0	2

Total Hours:30

Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Understanding the digital marketing concepts and its usefulness in business.
 CO2. Planning steps for digital marketing strategy and successfully executing it.
 CO3. Applying Search Engine Optimization techniques (SEO) and Search Engine Marketing (SEM) to maximize reach and enhance engagement of users.
 CO4. Analyzing web using analytics tools and gaining insights to various tools for Social.

Course Content

UNIT I

8 HOURS

Digital Marketing Basics: Digital Marketing meaning and its importance, Traditional vs Digital Marketing, Benefits of Digital Marketing, Internet Marketing basics, Digital Marketing channels, Types of Business models, Digital Marketing strategies (P.O.E.M framework), Inbound and Outbound marketing, Digital Transformation model, 4Cs of Digital Marketing.

UNIT II

7 HOURS

Social Media Marketing – Introduction, Social Media marketing strategies, Overview of Social media platforms – Instagram, Snapchat, Facebook, Mobile, Twitter, Content Planning and Strategy, Influential marketing, Content marketing, Digital Marketing campaign.

UNIT III

8 HOURS

Search Engine Optimization – Introduction to SEO, On-Page and OffPage Optimization, Role of Keywords in SEO, Organic vs Non-Organic SEO, Blogging as marketing strategy, Types of Blogs. Search Engine Marketing – Introduction to Paid marketing, Google Adwords, Types of campaigns and Campaign creation.

UNIT IV

7 HOURS

Tools for SMM and Marketing communication – Overview of Buffer, Hoot suite, Canva, Trello and Hot jar. Web Analytics: Meaning, Purpose and process, Types, Tools for analytics – Google analytics, Audience analytics, Acquisition analytics, Behavior analytics, Conversion analytics.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Gupta, R., & Madan, S. (2022). *Digital marketing* (1st ed.). BPB Publications.
- Gupta, S. (2018). *Digital marketing* (2nd ed.). McGraw Hill.
- Bhatia, P. S. (2020). *Fundamentals of digital marketing* (2nd ed.). Pearson.

- Joseph's College. (n.d.). *Digital marketing notes*.
https://josephscollege.ac.in/lms/Uploads/pdf/material/DigitalMarketing_Notes.pdf
- DigitalMarketer. (n.d.). *Ultimate guide to digital marketing*.
<https://www.digitalmarketer.com/digitalmarketing/assets/pdf/ultimate-guide-to-digital-marketing.pdf>

Web Sources

- <https://www.digitalmarketing.org/what-is-digital-marketing>
- <https://blog.hubspot.com/marketing>
- <https://www.semrush.com/blog/what-is-seo/>

Course Title: Media and digital communication	L	T	P	Cr.
Course Code: BCA6356	2	0	0	2

Total Hours:30

Course Learning Outcomes: After completion of this course, the learner will be able to:

Learners will achieve advanced communication skills, including effective media communication, digital communication, speechwriting, and presentation techniques, enabling them to craft compelling messages, engage diverse audiences, and convey ideas with clarity and persuasion in various personal and professional contexts.

Course Content

UNIT I 7 HOURS

Media Communication Strategies: Working with the Media, Writing Press Releases, and Creating Media Kits.

UNIT II 8 HOURS

Digital Communication Essentials: Social Media Communication, Effective use of social media platforms for personal and professional purposes, including content creation, engagement, and community building.

Online Etiquette and Professionalism: Understanding the importance of maintaining a professional online presence, including e-mail, social media behavior, and online communication best practices.

UNIT III 8 HOURS

Speechwriting and Scripting: Crafting Effective Speeches, Writing for Different Audiences. This involves understanding audience needs, structuring compelling content, and using persuasive language to engage and inspire listeners.

UNIT IV 7 HOURS

Advanced Presentation and Interview Skills: Advanced Presentation Techniques, Storytelling in Presentations, Using Persuasion and Emotional Appeal, Mock Interviews for Jobs.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings:

- Beebe, S. A., & Masterson, J. T. (2019). *Communicating in small groups: Principles and practices*.
- Hackman, M. Z., & Johnson, C. E. (2013). *Leadership: A communication perspective*.
- Mehl, N. L. (2013). *Working with the media*. Routledge.
- Oliver, S. S. (2018). *Media relations*. Kogan Page.
- Freberg, K. (2020). *Social media communication*. Routledge.
- Carnegie, D. (2017). *The art of public speaking*. Pocket Books.
- Weissman, J. (2019). *Presenting to win*. FT Press.
- Nussbaumer Knaflitz, C. (2015). *Storytelling with data*. John Wiley & Sons.

Web Sources

- <https://www.skillsyouneed.com/communication-skills.html>
- https://owl.purdue.edu/owl/general_writing/index.html
- <https://www.mindtools.com/communication-skills-and-techniques.html>

Elective- III

Course Title: Internet of Things	L	T	P	Cr.
Course Code: BCA6357	4	0	0	4

Total Hours:60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Understand the various concepts, terminologies and architecture of IoT systems.
- CO2. Use sensors and actuators for design of IoT.
- CO3. Understand and apply various protocols for design of IoT systems
- CO4. Use various techniques of data storage and analytics in IoT

Course Content**UNIT I** **15 HOURS**

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

UNIT II **15 HOURS**

Sensors Networks: Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, the node, Connecting nodes, Networking Nodes, WSN and IoT.

UNIT III **15 HOURS**

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols

UNIT IV **15 HOURS**

Data Handling & Analytics: Introduction, Big Data, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction to Hadoop. Introduction to data Analytics, Types of Data analytics, Local Analytics, Cloud analytics and applications.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Reading:

- Chaouchi, H. (n.d.). *The Internet of Things: Connecting objects to the web*. Wiley Publications.
- Hersent, O., Boswarthick, D., & Elloumi, O. (n.d.). *The Internet of things: Key applications and protocols*. Wiley Publications.

- Madisetti, V., & Bahga, A. (2014). *Internet of Things: A hands-on approach* (1st ed.). VPT.

Web Sources

- <https://www.geeksforgeeks.org/internet-of-things-iot-tutorial/>
- <https://www.ibm.com/topics/internet-of-things>
- https://www.tutorialspoint.com/internet_of_things/index.htm

Course Title: DATA SCIENCE	L	T	P	Cr.
Course Code: BCA6358	4	0	0	4

Total Hours:60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Recognize the various discipline that contribute to a successful data science effort.
- CO2. Understand the processes of data science identifying the problem to be solved, data collection, preparation, modeling, evaluation and visualization.
- CO3. Be aware of the challenges that arise in Data Sciences.
- CO4. Be able to identify the application of the type of algorithm based on the type of the problem.
- CO5. Be comfortable using commercial and open source tools such as the R/Python language and its associated libraries for data analytics and Visualization.

Course Content

UNIT I 15 HOURS

Defining Data Science and Big data, Benefits and Uses, facets of Data, Data Science Process. History and Overview of R, Getting Started with R, R Nuts and Bolts

UNIT II 15 HOURS

The Data Science Process: Overview of the Data Science Process-Setting the research goal, Retrieving Data, Data Preparation, Exploration, Modeling, data Presentation and Automation. Getting Data in and out of R, Using reader package, Interfaces to the outside world.

UNIT III 15 HOURS

Machine Learning: Understanding why data scientists use machine learning-What is machine learning and why we should care about, Applications of machine learning in data science, where it is used in data science, The modeling process, Types of Machine Learning-Supervised and Unsupervised.

UNIT IV 15 HOURS

Handling large Data on a Single Computer: The problems we face when handling large data, General Techniques for handling large volumes of data, generating programming tips for dealing with large datasets.

Sub setting R objects, Vectorized Operations, Managing Data Frames with the dplyr, Control structures, functions, Scoping rules of R, Coding Standards in R, Loop Functions, Debugging, Simulation. Case studies on preliminary data analysis.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative

Learning

Suggested Reading:

- Cielen, D., Meysman, A. D. B., & Ali, M. (2016). *Introducing data science*. Manning Publications.
- Peng, R. D. (2015). *R programming for data science*. Lean Publishing.
- Zumel, N., & Mount, J. (2014). *Practical data science with R*. Manning Publications.
- Ojeda, T., Murphy, S. P., Bengfort, B., & Dasgupta, A. (2014). *Practical data science cookbook*. Packt Publishing.

Web Sources

- <https://www.datacamp.com/tutorial/r-for-data-science>
- <https://www.geeksforgeeks.org/data-science-with-r/>
- <https://r4ds.had.co.nz/>

Course Title: Ethical Hacking	L	T	P	Cr.
Course Code: BCA6359	4	0	0	4

Total Hours:60

Course Learning Outcomes: After completion of this course, the learner will be able to:

- CO1. Evaluate new Hacking Methodology.
- CO2. Install hacking software on a closed network environment.
- CO3. Identify tools and techniques to carry out penetration testing.
- CO4. Exemplify security techniques used to protect system and user data.

Course Content

UNIT I 15 HOURS

Introduction to Ethical Hacking: Hacking Methodology, Process of Malicious Hacking, Foot printing and Scanning: Foot printing, Scanning. Enumeration: Enumeration. System Hacking and Trojans: System Hacking, Trojans and Black Box Vs White Box Techniques.

UNIT II 15 HOURS

Hacking Methodology: Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers. Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Techniques

UNIT III 15 HOURS

Web and Network Hacking: SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security. Linux Hacking: Linux Hacking. Evading IDS and Firewalls: Evading IDS and Firewalls

UNIT IV 15 HOURS

Report writing & Mitigation: Introduction to Report Writing & Mitigation, requirements for low level reporting & high-level reporting of Penetration testing results, Demonstration of vulnerabilities and Mitigation of issues identified including tracking

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Reading:

- Karake-Shalhoub, Z., & Al Qasimi, L. (2010). *Cyber law and cyber security in developing and emerging economies*. Edward Elgar Publishing.
- Palmer, C. C. (2001). Ethical hacking. *IBM Systems Journal*, 40(3), 769–780.
- Farsole, A. A., Kashikar, A. G., & Zunzunwala, A. (2010). Ethical hacking. *International Journal of Computer Applications*, 1(10), 14–20.
- Kaur, M., Kaur, J., & Kaur, M. (2025). *Ethical hacking: Concepts, techniques and practices*. Scientific International Publishing House.

Web Sources

- <https://www.geeksforgeeks.org/ethical-hacking-tutorials/>
- <https://www.coursera.org/articles/what-is-ethical-hacking>
- <https://www.kaspersky.com/resource-center/definitions/what-is-ethical-hacking>