

GURU KASHI UNIVERSITY



Bachelor of Computer Applications

Session: 2025-26

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:

Element of the Descriptor	Programme learning outcomes relating to Undergraduate Certificate
The graduates should be able to demonstrate the acquisition of:	
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
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.
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.
Generic learning outcomes	Strengthen problem-solving abilities, logical thinking, and analytical skills. Enhance communication and interpersonal skills.
Constitutional, humanistic, ethical, and moral values	Learn the importance of ethical conduct and values in personal and professional spheres.
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.
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

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.
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Program Structure of 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
BCA1105	Introduction to Web technologies - I	Vocational Course	0	0	4	2	30	70	100
BCA1106	PC Assembling and Trouble Shooting	Skill Enhancement Course	0	0	6	3	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
BCA2155	Introduction to Web technologies - II	Vocational Course	0	0	4	2	30	70	100
BCA2156	Multilingual Typing and Stenography	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			17	0	14	24	300	700	1000

Programme learning outcomes: An Undergraduate Diploma is awarded to students who have demonstrated the achievement of the outcomes located at level 5:

Element of the Descriptor	Programme learning outcomes relating to Undergraduate Diploma
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	A strong foundation in computer programming, database management, web technologies, and basic networking concepts.
	An understanding of software development methodologies, including problem analysis, algorithm design, and structured programming principles.
	The ability to comprehend the role of technology in solving business and real-world problems effectively.
	Knowledge of basic operating systems concepts and their role in managing hardware and software resources.
Skills required to perform and accomplish tasks	The ability to develop basic computer applications using programming languages like C, Python, and Java.
	Skills to design and manage databases using SQL for data storage, retrieval, and manipulation.
	Proficiency in using web technologies, including HTML, CSS, and JavaScript, to create functional and user-friendly websites.
Application of knowledge and skills	Apply programming and database skills to develop small-scale software applications. Use networking knowledge to configure basic network setups and solve connectivity issues.
Generic learning outcomes	Demonstrate effective communication, teamwork, and collaboration in academic and professional settings. Display critical thinking, problem-solving, and decision-making abilities in the IT domain.
Constitutional, humanistic, ethical, and moral values	Uphold professional ethics and integrity in handling data and software applications. Foster an inclusive and respectful attitude towards diversity in work and society.
Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	Acquire job-ready skills in IT domains such as application development, database management, and basic networking. Develop an entrepreneurial mindset to identify and solve market problems using technology solutions.

Credit requirements	96 credits including the 4 credits of internship of duration 8 weeks duration as per scheme of the programme and will be awarded Undergraduate Diploma in the Computer Applications.
Entry requirements	Passed 10+2 with computer Operator and Programming Assistant (COPA) OR Passed Diploma in Engineering with at least 45% in the aggregate. OR Passed 10+2 with 1 year Diploma in Computer Application/IT from a recognized university/Board/Council or equivalent.

Semester 3rd									
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
BCA3208	Network Administration	Skill Enhancement Course	0	0	6	3	30	70	100
BCA3209	- Soft Skills and Personality Development	Ability Enhancement Course	2	0	0	2	30	70	100
Total			17	0	14	24	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- I (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	240	560	800

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

Element of the Descriptor	Programme learning outcomes relating to Bachelor Degree
The graduates should be able to demonstrate the acquisition of:	
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.
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.
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.
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.
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.
Employability and job-ready	Be industry-ready with job-specific skills in areas like software development, data analysis, networking, and

skills, and entrepreneurship skills and capabilities/qualities and mindset	cybersecurity. Acquire an innovative and problem-solving mindset to meet challenges in the IT industry.
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	240	560	800

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 Enhance ment Course	2	0	0	2	30	70	100
Discipline Elective- II (Any one of the following)									
BCA6357	Internet of Things	Disciplin ary 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			102	0	76	144			

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:

1. Develop confidence for self-education and ability for life-long learning needed for Computer language.
2. Handle possible errors during program execution.
3. Build logic used in Programming.
4. 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**

Basics of 'C' Language: History, Structure of a C program, Data types, Constants and variables, Operators and Expressions, I/O functions: Formatted & Unformatted Input/Output.

Control constructs: If, If-else, nested if-else, else-if ladder, switch, go to, for, while, do... while, jumps in loops: break and continue.

Unit-II**15 hours**

Preprocessor: #define, #include, #undef, #conditional compilation directives (#if, #else, #elif, #endif, #ifdef and #ifndef), Storage classes, Header files (stdio.h, ctype.h, string.h, math.h, stdlib.h, time.h); Type casting, Type conversion, Scope Rules: Local and Global variables.

Functions: library functions, user defined functions, scope rule of functions, Parameter passing: call by value and call by reference, calling functions with Arrays, Recursion: Basic concepts, Design examples (Tower of Hanoi).

Unit-III**10 hours**

Arrays: Creating and using one dimensional and two-dimensional arrays
Strings: Introduction to strings, declaring and initializing string variables, reading and writing strings, string handling functions.

Pointers: & and * operators, Declaring and initializing pointers, Pointer expression, Pointer assignments, Pointer arithmetic. The dynamic memory allocation functions – malloc and calloc, Pointer vs Arrays, Passing Array to functions, Arrays of pointers, and Functions with variable number of arguments.

Unit-IV**10 hours**

Structures: Basics of Structures, declaring a structure, referencing structure elements, Array of structures, passing structures to functions. Unions: Declaration, Uses; Enumerated data types.

File Handling: Introduction, creating a data file, opening and closing a data file, file Pointers, file accessing functions (fopen, fclose, putc, getc, fprintf); argc and argv; File opening modes: Text mode, Binary mode.

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:

- *Balaguruswami, Programming with C Language, Tata McGraw Hill, New Delhi*
- *Schaum Series, Programming in C, McGraw Hills Publishers, New York.*
- *Salaria, R. S., Application Programming in C, Khanna Book Publishing. New Delhi.*
- *Yashavant P. Kanetkar, Let us C, BPB Publications, New Delhi.*
- *Salaria, R.S. : Test Your Skills in C, Salaria Publications, New Delhi.*
- *Byron S. Gottfried, Programming in C, McGraw Hills Publishers, New York.*
- *M.T. Somashekara, 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://www.includehelp.com/c-programming-examples-solved-c-programs.aspx>
- <https://www.studocu.com/in/document/bengaluru-north-university/bca/problem-solving-techniques-using-c/16264070>

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:

1. Classify binary, hexadecimal and octal number systems and their arithmetic operations.
2. Analyze the concept of computer devices and the recognition of the basic terms used in computer programming.
3. Identify and learn the details of the components of a personal computer system.
4. 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. and Sinha P. (2002). Foundations of Computing, First Edition, BPB.*
- *Sanders D.H. (1988). Computers Today, Fourth Edition, McGraw Hill.*
- *Rajaraman V. (1996). Fundamentals of Computers, Second Edition, Prentice Hall of India, New Delhi.*
- *Jain Satish (1999). Information Technology, Paperback Edition, BPB.*
- *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

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

1. Have a clear understanding of mathematical functions.
2. Develop an in-depth knowledge of mathematical theories.
3. Develop skills to get employment IT and Analysis field.
4. 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.

UNIT-II 15 Hours

Relations: Types of relations: reflexive, symmetric, transitive, and equivalence relations. Functions: One-to-one and onto 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.*

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:

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

Course Content

1. Write a program to display your name.
2. Write another program to print a message with an inputted name.
3. Write a program to add two numbers.
4. Write a program to find the square of a given number
5. Write a program to calculate the average of three real numbers.
6. Write a program to find ascii value of a character
7. Write a program to find the size of int, float, double and char
8. Write a program to compute quotient and remainder
9. Write a program to accept the values of two variables.
10. Write a program using various unformatted input functions
11. Write a program to find area of rectangle and print the result using unformatted output functions
12. Write a program to find the larger of two numbers.
13. Write a program to find greater of three numbers using nested if.
14. Write a program to find whether the given number is even or odd.
15. Write a program to generate multiplication table using for loop
16. Write a program to generate multiplication table using while loop
17. Write a program to make a simple calculator using switch...case
18. Write a program to find whether the given number is a prime number.
19. Write a program using function to find the largest of three numbers
20. Write a program using a function to print the first 20 numbers and its squares.
21. Write a program to find the factorial of a given number.
22. Write a program to print the sum of two matrices
23. Write a program to find the length of a string
24. Write a program to copy string using strcpy()
25. Write a program to compare a string

26. Write a program to reverse a string
27. Write a program to check whether entered string is palindrome or not.
28. Write a program to check whether entered number is Armstrong or not.
29. Write a program to check prime numbers from a user entered range.
30. Write a program to multiply two numbers using pointers.
31. Write a program to display address of variable using pointers
32. Write a program to show the memory occupied by structure and union.
33. Write a program to create student i-card using a structure
34. Write a program to read data from a file from a file
35. Write a program to save employee details in a file using file handling

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:

1. Compose, format and edit a word document.
2. Edit and forward email messages (with or without attachments).
3. Utilize the MS PowerPoint with custom animation and slide orientation.
4. 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.

Course Title: Introduction to Web Technologies I	L	T	P	Cr.
Course Code: BCA1105	0	0	4	2

Total Hours:60

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

1. Describe the Internet, its architecture, services and protocol.
2. Implement a simple search engine.
3. Implement a web crawler.
4. Use JavaScript technologies to make a website highly responsive, more efficient and user friendly

Course Contents

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.

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:

1. Knowledge about the motherboard, bios and storage device features and its functions.
2. Install OS (Linux/windows) on their systems.
3. Get knowledge about ports and wires.
4. Install system and software applications.
5. 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.

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:

1. Understand the fundamental principles and functions of management in organizational contexts.
2. Apply management practices to plan, organize, lead, and control effectively.
3. Analyze real-world business scenarios to develop problem-solving and decision-making skills.
4. 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

10Hours

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:

- *Principles and practices of management: L. M. PRASAD (S. Chand publishers)*
- *Essentials of Management: Koontz H. & Weihrich H. (Tata Mc Graw Hill Publishers)*
- *Management: Stephen Robbins (Pearson publishers)*
- *VSP Rao & V H Krishna, Management, Excel books*

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:

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

Course Content

UNIT-I

7 Hours

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration-what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-II

8 Hours

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

UNIT-III

8 Hours

Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the

harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!.

UNIT-IV

7 Hours

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.

Transactional Mode:

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

Suggested Reading:

- *R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.*
- *Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA*
- *E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.*
- *Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991*
- *Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.*
- *A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.*
- *P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.*
- *A N Tripathy, 2003, Human Values, New Age International Publishers.*

- *SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.*
- *E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press*
- *M Govindrajan, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.*
- *B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.*
- *B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.*

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:

1. Formulate an outline for effective Organizational Communication.
2. Summarize the information, ideas, concepts and opinions from a variety of sources.
3. Attain the competence in oral, written, and visual communication.
4. 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:

- *English Online, Mohanraj & Mohanrah, Orient Longman.*
- *The Good Grammar Book Swan M & Catherine Walter, Oxford.*
- *English Grammar Composition and Effective Business Communication, Pink and*
- *Thomas, S Chand.*

- *Business Communication, Meenakshi Raman & Sangeeta Sharma, Oxford.*
- *Oxford Business English Dictionary, Oxford.*
- *Technical Communication: Principles and Practice, Meenakshi Raman & Sangeeta Sharma, Oxford.*
- *Developing Communication Skills, Krishna Mohan & Meera Benarji, MacMilan Pub.*
- *Personality development and soft skill, Baran Mitra, Oxford.*

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:

1. Discuss about the programming techniques to solve problems or errors in the C++ programming language.
2. Attain the conceptual knowledge of array and string.
3. Describe the constructor and class member function.
4. Analyze the inheritance with the understanding of early binding and late binding.

Course Content**UNIT-I****10 hours**

Introduction to Object Oriented Programming Concepts: Object, Class, Encapsulation, Data hiding, Inheritance and Polymorphism; analysis and design of system using object-oriented approach.

C++ Basics: Token, keywords, Identifiers, Basic data types, user defined and derived data types, symbolic constants, declaration of variables, dynamic initialization of variables, reference variables, operators in C++, I/O streams, Control structures.

Classes and Objects: Specifying a class, defining data members and member functions, private and public member functions, member function definition inside/outside the class declaration, scope resolution operator, nesting of member functions, creating and declaring objects, accessing class data members, accessing member functions, static data members and member functions.

UNIT-II**10 hours**

Constructors and destructors: Introduction, default constructors, parameterized constructors, multiple constructors in a class, copy constructors, dynamic constructors; Destructors: Definition and use.

Functions in C++: Function prototyping, pass by value, pass by reference, inline functions, default arguments, const arguments, function overloading, Friend functions, Objects as function arguments, friendly functions, and returning objects

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

UNIT-III**10 hours**

Extending Classes using Inheritance: Introduction, base class, derived class, defining derived classes, visibility modes: private, public, protected; single inheritance: privately derived, publicly derived; making a protected member inheritable, access control to private and protected members by member functions of a derived class, multilevel inheritance, virtual base classes, abstract classes, nesting of classes.

Pointers, Virtual Functions and polymorphism: virtual and pure virtual functions, function overloading, operator overloading.

UNIT-IV**15 hours**

Console I/O Operations: C++ Stream Classes, Unformatted I/O functions-put(), get(), getline(), write(), Formatting with ios class functions and flags, Manipulators.

Files and Streams: Text and binary streams, The stream class hierarchy, Processing files, declaring files, opening files using open() function or constructor function, closing files, String I/O, Sequential and random Access, File updation.

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., Balagurusamy, E., & Balagurusamy, E. (2001). *Object oriented programming with C++*. Tata McGraw-Hill Publishing Company.
- 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.

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

1. Describe the fundamental concepts of Operating System.
2. Solve the various types of Scheduling Algorithms for better utilization of external memory.
3. Attain the knowledge about deadlock detection algorithms.
4. 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..

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:

1. Implement the Logical and Algebraic operations.
2. Demonstrate the basic principles of relation in a set.
3. Solve the various methods of Recurrence relations.
4. 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.*
- <https://www.javatpoint.com/discrete-mathematics-tutorial> h
- <https://www.geeksforgeeks.org/discrete-mathematics-tutorial/>
- https://www.tutorialspoint.com/discrete_mathematics/index.htm

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

1. After the completion of the course the learner will be able to
2. Classify the object-oriented concepts and their implementation.
3. Use the concepts of array and string using C++.
4. Implement a given program solved by C++.
5. Grasp the concept of implementing the constructors with classes.

Course Content

1. Write a program to print
 - 1
 - 12
 - 123
 - 1234
 - 12345
2. Write a program to find whether the number is even, odd.
3. Write a program to find the greatest out of three numbers.
4. Write a program to find whether the number is palindrome or not.
5. Write a program to print prime number Series.
6. Write a program to find the reverse of a number.
7. Write a program to find the factorial of a number.
8. Write a program to implement switch case in C++.
9. Write a program to implement for loop, while loop and do-while loop in C++.
10. Write a program to enter a record of 50 students.
11. Write a program to implement call by value.
12. Write a program to show call by reference in C++.
13. Write a program to create structure in C++.
14. Write a program to find the area of circle, rectangle and polygon by using structure.
15. Write a program to create classes in C++.
16. Write a program that uses a class where the member functions are defined inside a class.
17. Write a program to demonstrate the use of static data members.
18. Write a program to demonstrate the use of keyword const data members.
19. Write a program using constructors in C++.
20. Write a program using destructors in C++.
21. Write a program using multiple constructors in C++.
22. Write a program using the Copy constructor in C++.

23. Write a program to demonstrate the single inheritance.
24. Write a program to demonstrate the multilevel inheritance.
25. Write a program to demonstrate the multiple inheritances.
26. Write a program showing hierarchical inheritance in C++.
27. Write a program to implement function overloading.
28. Write a program to demonstrate the overloading of binary arithmetic operators.
29. Write a program showing operator overloading in C++.
30. Write a program to demonstrate the use of function templates.
31. Write a program to demonstrate the use of class templates.
32. Write a program showing Exception handling in C++.
33. Write a program to read and write data from a file in C++.
34. Write a program to demonstrate the reading and writing of mixed types of data.
35. Write a program to demonstrate the reading and writing of object.

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

1. Get expertise on the Unix OS platform.
2. Develop and debug C programs created on UNIX platforms.
3. Install the standard libraries of the Operating System.
4. 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.

Course Title: Introduction to Web technologies – II	L	T	P	Cr.
Course Code: BIT2155	0	0	4	2

Total Hours:60

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

1. Students are able to develop a dynamic webpage by the use of java script and DHTML.
2. Students will be able to write a well formed / valid XML document.
3. Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
4. 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.
5. 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 a simple webpage using HTML.
2. Use frames to Include Images and Videos.
3. Add a Cascading Style sheet for designing the web page.
4. Design a dynamic web page with validation using JavaScript.
5. Design an HTML having a text box and four buttons viz Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate JavaScript function should be called to display Factorial of that number Fibonacci series up to that number Prime numbers up to that number. Is it palindrome or not
6. Write java script programs to demonstrate
 - Math Object with at least five methods.
 - String Object with at least five methods.
 - Array Object with at least five methods.
 - Date Object with at least five methods.
7. Write JavaScript programs on Event Handling
 - Validation of registration form
 - Open a Window from the current window
 - Change color of background at each click of button or refresh of a page
 - Display calendar for the month and year selected from combo box
 - On Mouse over even
8. Write a java program to connect to a database server using JDBC and insert 10 student's information of user choice in to student table.
9. Write a java program to display all records in the student table.
10. Develop a simple Servlet to display Welcome to Servlet.

11. Develop a Servlet to validate user name and password with the data stored in Servlet configuration file. Display authorized user if she/he is authorized else display unauthorized user.
12. Develop a Servlet to validate user name and password stored in database. Display authorized user if she/he is authorized else display unauthorized user.
13. Write a Servlet program to store student details sent from registration form in to database table.
14. Write JSP Program to store student information sent from registration page into database table.
15. Develop a program to validate username and password that are stored in Database table using JSP.
16. Write appropriate JSP pages to insert, update and delete data in student table in a single application with proper linking of JSP pages and session management.

Suggested Readings:

- Chris Bates, *“Web Programming-Building Internet Applications”, 2nd ed., Wiley Publishers, 2006.*
- Diet eland Nieto, *“Internet and World Wide Web-How to Program”, 4th ed., PHI/ Pearson Education Asia, 2007.*
- Hans Bergsten, *“Java Server Pages”, 1st ed., O’REILLY Publications, 2000.*
- Jennifer Niederst, Robbins, *“Learning Web Design”, 3rd ed., SPD O’REILLY Publications, 10.*
- Firuza Aibara, *“HTML for Beginners”, 2nd ed., SPD O’REILLY Publications, 2010.*
- . Marty Hall, *“Core Servlets and Java Server Pages”, 1st ed., Prentice Hall PTR, 2000.*
- *The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH*

Course Title: Multilingual Typing and Stenography	L	T	P	Cr.
Course Code: BCA2156	0	0	6	3

Total Hours:90**Course Content**

1. Introduction to Hindi Fonts,Matra and sentences
2. Basic training in Hindi Typing: Home Row Keys practice, Practice of Shift+Home row letters, Practice upper row letters,Practice Shift+upper row letters.
3. Introduction to English Fonts. Basic Typing Techniques.
4. Home Row Keys.
5. Finger Exercises.
6. Typing Drills.
7. Shorthand (Stenography)
8. English and Hindi Shorthand.
9. Phraseography
10. Transcription
11. Speed Building

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

1. Understand the significance of HRM, distinguish it from Personnel Management (PM), and identify HR challenges.
2. Apply HRM principles to practical situations such as recruitment, selection, and induction.
3. Analyze performance appraisal methods and training programs.
4. 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 Reading:

- *Fundamentals of Human Resource Management by David A. DeCenzo, Stephen P. Robbins, and Susan L. Verhulst.*
- *Effective Human Resource Management: A Global Analysis by Edward Lawler, John Boudreau, and Susan Albers Mohrman.*
- *Human Resource Management: Gaining a Competitive Advantage by Raymond Noe, John Hollenbeck, Barry Gerhart, and Patrick Wright*

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:

1. Acquire the basic knowledge of Environment study.
2. Attain the information about the ecosystem and its functioning.
3. Discuss the role of individuals in prevention of pollution.
4. Elaborate the role of information technology in the environment and human health.

Course Content

UNIT-I

8 Hours

The Multidisciplinary nature of environmental studies Definition, scope and importance, Need for public awareness.

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.

Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.

Water resources: Use and over-Utilization of surface and ground water, floods, drought, conflicts and water, dams-benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

UNIT-II

7 Hours

E-Concept of an ecosystem: Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.

Biodiversity and its conservation: Introduction – Definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation.

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**

Social Issues and the Environment: From Unsustainable to Sustainable
 development, Urban problems related to energy, Water conservation, rain
 water harvesting, watershed management, Resettlement and rehabilitation of
 people; its problems and concerns, Environmental ethics: Issues and possible
 solutions, Climate change, global warming, acid rain, ozone layer depletion,
 nuclear accidents and holocaust, Wasteland reclamation, Consumerism and
 waste products, Environment Protection Act, Air (Presentation and Control of
 Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife
 Protection Act, Forest Conservation Act, Issues involved in enforcement of
 environmental legislation.

Human Population and the Environment: Population growth, variation among
 nations, Population explosion – Family Welfare Programme, Environment and
 human health, Human Rights, Value Education, HIV / AIDS, 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.*

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

1. Formulate an outline for effective Organizational Communication.
2. Summarize the information, ideas, concepts and opinions from a variety of sources.
3. Attain the competence in oral, written, and visual communication.
4. 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 favorite 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.

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

1. Apply appropriate constructs of Programming language, coding standards for application development.
2. Select appropriate data structures for problem solving and programming
3. Identify appropriate searching and/or sorting techniques for a wide range of problems and data types.
4. 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). [Introduction to] Schaum's Outline of Data Structures with Java. McGraw-Hill.*
- *Horowitz, E., & Sahni, S. (1976). Fundamentals of data structures (Vol. 1982). Potomac, MD: Computer science press.*
- *Wirth, N. (1985). Algorithms & data structures. Prentice-Hall, Inc..*
- *Tarjan, R. E. (1983). Data structures and network algorithms. Society for Industrial and Applied Mathematics.*

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

1. After the completion of the course the learner will be able to
2. Identify the difference about database systems from the file systems by enumerating their features.
3. Acknowledge the role of the database administrator.
4. Retain the knowledge about physical and logical database designs.
5. 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., & Gehrke, J. (2003). *Database management systems (Vol. 3)*. New York: McGraw-Hill.
- Korth F. Henry. *Database System Concepts*, McGraw Hill
- Lu, G. (1999). *Multimedia database management systems*. Boston: Artech House.
- Date, C. J. (1975). *An introduction to database systems*. Pearson Education India.

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

1. Classify the fundamental concepts and techniques used in digital electronics.
2. Apply the principles of number system, binary codes and Boolean algebra to minimize logic expressions.
3. Identify the basic requirements for designing an application.
4. 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. 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.*

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:

1. Apply appropriate constructs of Programming language, coding standards for application development
2. Select appropriate data structures for problem solving and programming
3. Identify appropriate searching and/or sorting techniques for a wide range of problems and data types.
4. 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.

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:

1. Solve the query of the database using SQL DML / DDL commands.
2. Enforce integrity constraints on a database.
3. Apply the basic concepts of Database Systems and Applications.
4. 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

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:

1. Understand the basic concepts of multimedia, including text, audio, video, animation, and graphics.
2. Apply multimedia tools and techniques to create interactive presentations and digital content.
3. Demonstrate knowledge of multimedia file formats, data compression, and storage techniques.
4. 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 -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:

- *S.Gokul, "Multimedia Magic", BPB Publications, 2nd Edition.*
- *Tay Vaughen , "Multimedia Making it Work", TMH, 6th Edition.*
- *Kiran Thakrar, Prabhat k.andleigh, "Multimedia System Design", Prentice Hall India.*
- *Malay k Pakhira, "Computer graphics, Multimedia and Animation", Prentice Hall India, 2nd Edition.*

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:

1. Identify and utilize various tools for multimedia processing.
2. Design the images with appropriate tools from the toolbox.
3. Apply practical knowledge to create image animations.
4. 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.

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:

1. To expose the students to the fundamentals of Organizational Behavior (OB) –
2. such as working with people, nature of organizations, communication, leadership and motivation of people.
3. To help students develop a conceptual understanding of OB theories
4. 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*

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

Total Hours:90

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

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 (Open Daylight)
13. Network topology programming with Mininet and visualization

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:

1. Student will get Effective Communication Skills.
2. Develop good Interpersonal Skills and Teamwork in students.
3. 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*, Narendera Publishing House. 2023

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:

1. Solve the computational problems using basic statements like if-else, control structures, array, and strings.
2. Knowledge about the user requirements for software functionality in Java programming language.
3. Apply basic principles of creating Java applications with Applet programming.
4. 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.

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:

1. Understand the variables, expressions and statements.
2. Apply conditional and looping constructs.
3. Design and import functions in python programming.
4. 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:

- *Python Crash Course" by Eric Matthes*
- *"Automate the Boring Stuff with Python" by Al Sweigart*
- *"Fluent Python" by Luciano Ramalho*
- *"Python Cookbook" by David Beazley and Brian K. Jones*
- *"Effective Python: 90 Specific Ways to Write Better Python" by Brett Slatkin*

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

Total Hours: 60

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

1. Figure out the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction and deployment.
2. Review the techniques of software lifecycle.
3. Perform the various testing techniques.
4. 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.*

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:

1. Discuss about the concepts of object-oriented programming.
2. Test the performance of Exception handling and multi-threading.
3. Implementing and Debugging the Java programs.
4. 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, 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 which 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.

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:

1. Write, Test and Debug Python Programs.
2. Implement Conditionals and Loops for Python Programs.
3. Use functions and represent Compound data using Lists.
4. Implement the basic conditional and looping constructs.

Course Content

Program 1: Print “Hello” world

Program 2: Add numbers and concatenate strings

Program 3: Input from user

Program 4: loops

Program 5: if-else - conditional checking

Program 6: Functions

Program 7: Math library

Program 8: Strings

Program 9: Exceptional handling

Program 10: Random numbers/string

Program 11: Demo of data structure – list

Program 12: Demo of data structure - dictionary

Program 13: Demo of data structure – tuple

Program 14: Command line argument

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**Learning Outcomes:**

The course is a walk for the students to gain a holistic knowledge on human health. The course provides elementary idea on various nutrients and their impacts on human physiology. In addition, students will be able to learn some of the common diseases and their management strategies. The last segment of this course deals with the stress and its management.

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, 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:

- *Textbook of Preventive and Social Medicine - Banarsidas Bhanot Publishers, by K. Park*
- *Nutrition Science - New Age International Publishers, by B. Srilakshmi*
- *Principles of Anatomy and Physiology - Wiley, by G. J. Tortora & B. Derrickson*
- *Abnormal Psychology and Modern Life - Pearson, by R. C. Carson, J. N. Butcher, & S. Mineka*
- *Nutritive*
- *Value of Indian Foods - National Institute of Nutrition (NIN), by C. Gopalan, B. V. R. Sastri, & S. C. Balasubramanian*

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:

1. To improve the communicative competence of learners
2. To help learners use language effectively in academic /work contexts
3. To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
4. To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.
5. 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:

- *Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.*
- *English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.*
- *The Definitive Book of Body Language. Pease, Allan and Barbara Pease. Manjul Publishing House*

- *Basic Business Communication: Skills for Empowering the Internet Generation: Lesikar, Raymond V and Marie E. Flatley. Tata McGraw-Hill Publishing Company Ltd...*
- *Louder than Words, Joe Nevarro, Harper Collins Publishers.*
- *Motivation Book (You Can Win) By – Shiv Khera, MacMillan India Ltd.*

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:

1. Recognize and comprehend formal reasoning languages.
2. Use basic concepts of formal languages of finite automata techniques
3. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.
4. 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, Unsolvable Problems: A Non-recursive

Language and an Unsolvable 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, Chomsky hierarchies 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. (1996). *Introduction to the Theory of Computation*. ACM Sigact News, 27(1), 27-29.
- Kozen, D. C. (2006). *Theory of computation* (Vol. 121). Heidelberg: Springer.
- Martin, J. C. (2022). *Introduction to Languages and the Theory of Computation*.

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:

1. Discuss the building blocks of Big Data.
2. Articulate the programming aspects of cloud computing.
3. Represent the analytical aspects of Big Data.
4. 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:

- *Chris Eaton, (2012). Dirk derooet al., Understanding Big data, McGraw Hill.*
- *Tom White, (2012). HADOOP: The definitive Guide, O Reilly.*
- *Hurwitz, J., Nugent, A., Halper, F., & Kaufman, M. (2013). Big data for dummies (Vol. 336). Hoboken, NJ: John Wiley & Sons.*

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:

1. The issues relating to hardware and software design concepts associated with processor in Embedded Systems.
2. The concept of low power microcontrollers.
3. 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:

- Tammy Noergaard *“Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers”*, Elsevier (Singapore) Pvt.Ltd.Publications, 2005.
- John H. Davies *“MSP430 Microcontroller Basics”*,Elsevier Ltd Publications, Copyright 2008.
- Manuel Jiménez Rogelio,PalomeraIsidoroCouvertier *“Introduction to Embedded SystemsUsing Microcontrollers and the MSP430”* Springer Publications, 2014.
- Frank Vahid, Tony D. Givargis, *“Embedded system Design: A Unified Hardware/Software Introduction”*, John Wily & Sons Inc.2002.
- Peter Marwedel, *“Embedded System Design”*, Science Publishers, 2007.
- Arnold S Burger, *“Embedded System Design”*, CMP Books, 2002.
- Rajkamal, *“Embedded Systems: Architecture, Programming and Design”*, TMH Publications,Second Edition, 2008.

Semester-V

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

Total Hours: 60

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

1. Identify problems that are amenable to solution by specific AI methods
2. Represent knowledge in Prolog and write code for drawing inferences.
3. Identify appropriate AI technique for the problem at hand
4. 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. (1992). *Artificial intelligence*. Addison-Wesley Longman Publishing Co., Inc.
- Winston, P. H. (1984). *Artificial intelligence*. Addison-Wesley Longman Publishing Co., Inc.

- *Boden, M. A. (Ed.). (1996). Artificial intelligence. Elsevier.*
- *Hunt, E. B. (2014). Artificial intelligence. Academic Press.*

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

Total Hours: 60

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

1. Describe Standard raster and vector scan devices as well as Graphical Input and output devices.
2. Implement algorithms for drawing basic primitives such as line circle and ellipse.
3. Implement algorithms for line clipping and polygon clipping and filing.
4. 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 Overview of Graphics Systems: Video Display Devices, Cathode Ray Tube, CRT monitors, Flat panel displays: Plasma Panel display, Thin-film electroluminescent displays, LED, Liquid Crystal Displays (LCD), Raster Scan Systems, Random Scan Systems.

UNIT-II

15 Hours

Drawing and clipping primitives: Raster scan line, circle and ellipse drawing algorithms, Polygon filling, line clipping and polygon clipping algorithms. Filled area primitives, character generation, Antialiasing.

UNIT-III

15 Hours

Transformation and Viewing: 2D and 3D Geometric Transformations, 2D and 3D Viewing Transformations (Projections- Parallel and Perspective), Vanishing points.

UNIT-IV

15 Hours

Geometric Modeling: Polygon Mesh Representation, Cubic Polynomial curves (Hermite and Bezier). Visible Surface determination and Surface Rendering: Z-buffer algorithm, List-priority algorithm and area subdivision algorithm for visible surface determination. Illumination and shading models, RGB color model and Basics of Computer Animation.

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., & Baker, M. P. (2004). *Computer graphics with OpenGL* (Vol. 3). Upper Saddle River, NJ:: Pearson Prentice Hall
- Foley, J. D., Van Dam, A., Feiner, S. K., Hughes, J. F., & Phillips, R. L. (1994). *Introduction to computer graphics* (Vol. 55). Reading: Addison- Wesley.
- Shirley, P., Ashikhmin, M., & Marschner, S. (2009). *Fundamentals of computer graphics*. AK Peters/CRC Press.
- Foley, J. D., Van, F. D., Van Dam, A., Feiner, S. K., Hughes, J. F., &
- Hughes, J. (1996). *Computer graphics: principles and practice* (Vol. 12110). Addison-Wesley Professional.

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:

1. Demonstrate proficiency in programming logic and problem-solving by successfully implementing various Prolog programs, such as calculating the sum of two numbers and finding the maximum of two numbers.
2. Understand recursive programming techniques through the implementation of Prolog programs, including factorial calculation and generating Fibonacci series.
3. Apply mathematical concepts in programming by successfully implementing Prolog programs, such as calculating the greatest common divisor (GCD) of two numbers and raising a number to a given power.
4. Develop proficiency in working with lists and manipulating them using Prolog predicates, as demonstrated in programs such as checking membership of an element in a list and appending lists together.

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.

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

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

1. Apply mathematics and logic to develop Computer programs for elementary graphic operations
2. Implement the Flood Fill Algorithm.
3. Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics
4. 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 Mini Project: - Moving Car

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:

1. Understand development of education and their historical importance in India.
2. To know about the education system in ancient era, buddha era their relation and knowledge.
3. To understand the commission for development of education, committee and their importance.
4. To understand the problems about education.

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, Oriental 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**

Universalization of Primary education Vocationalisation of Secondary Education, Student peace and balance in education occasion.

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., *Landmarks in the History of Modern Indian Education*. Vikas Publishing House
- Mitra, S.K., *Education in Ancient India*, Asha Jyoti Book Sellers

- *Mukherjee, S.N., History of Education in India: Modern Period, Acharya Book Depot*
- *Keay, F.E., Indian Education in Ancient and Later Times, Oxford University Press*
- *Sharma, R.A., Development of Educational System in India, R. Lall Book Depot*

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:

1. Identify various concepts of mobile programming that make it unique from programming for other platforms, Critique mobile applications on their design pros and cons.
2. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
3. Program mobile applications for the Android operating system that use basic and advanced phone features.
4. 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:

- T1. Lauren Darcey and Shane Conder, *“Android Wireless Application Development”*, Pearson Education, 2nd ed. (2011)
- R1. Reto Meier, *“Professional Android 2 Application Development”*, Wiley India Pvt Ltd
- R2. Mark L Murphy, *“Beginning Android”*, Wiley India Pvt Ltd
- R3. *Android Application Development All in one for Dummies* by Barry Burd, Edition:

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

Total Hours:30**List of Experiments:**

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 Radio buttons.
9. Design an android application for menu.
10. 10.Create a user registration application that stores the user details in a database table.

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:

1. Identify how to optimize on-page elements including titles, meta descriptions, page headings and body copy.
2. Create a content marketing strategy to support SEO and link acquisition.
3. Applying skills needed to attempt Google Ads Certifications
4. 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:

- *Flipped Teaching, Collaborative Learning. Suggested Readings*
- Das, S. (2021). *Search engine optimization and marketing: A recipe for success in digital marketing. CRC press.*
- Zilincan, J. (2015, September). *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.*

Semester VI

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

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

1. Describe the basic concepts of Bayesian Decision Theory.
2. Implement the working of perceptron learning algorithm, criterion and Widrow-Hoff learning algorithm.
3. Depict the algorithms like Nearest Neighbor classification, K-nearest neighbor and their applications.
4. 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.*
- *Mitchell, T. M., & Mitchell, T. M. (1997). Machine learning (Vol. 1, No. 9). New York: McGraw-hill.*
- *Bishop, C. M., & Nasrabadi, N. M. (2006). Pattern recognition and machine learning (Vol. 4, No. 4, p. 738). New York: Springer.*

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:

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

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:

- *Cloud computing a practical approach* - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
- *Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online* - Michael Miller - Que 2008
- *Cloud computing for dummies-* Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
- *Cloud Computing (Principles and Paradigms)*, Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

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:

1. Knowledge about management aspects of information security.
2. Should be able to summarize security risk and associated assessment models like COBIT.
3. Should distinguish proactive security mechanisms, like firewalls, IDS/IPS etc and application audit methodology.
4. 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:

- *Bel G. Raggad, Information Security Management: Concepts and Practice, CRC Press.*
- *Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and BestPractices, First Edition, Wiley India Pvt Ltd, 2009.*
- *Michael Whitman and Herbert Mattord, Management of Information Security, Fourth Edition, CengageLearning, 2014.*
- *Michael Whitman and Herbert Mattord, Principles of Information Security,*

Fifth Edition, Cengage Learning, 2015.

- *Harold F. Tipton, Information Security Management Handbook, Sixth edition, CRC Press, 2012.*
- *Thomas R. Peltier, Information Security Policies and Procedures, 2nd Edition, Auerbach Publications, 2004.*

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:

1. Understand the Basic operations of Linear Algebra in Machine Learning.
2. Use various Supervised Learning techniques like Linear Regression and Nonlinear Regression.
3. Apply Statistical approaches for multiple Learning techniques.
4. Construct models for Classification.
5. Build neural network models.

Course Content

LIST OF PROGRAMS:

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 Data Frame
 - b) Summarize the data frame and observe the statistics of the Data Frame 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.
5. 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.
6. 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.
 7. 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.
 8. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
 9. Write a program to implement Support Vector Machine algorithm to classify the iris data set. Print both correct and wrong predictions.
 10. 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.
 11. 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.
 12. Write a program to construct a Regression tree for cost estimation by assuming any numerical dataset.
 13. 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.
 14. Implement a single neural network and test for different logic gates.
 15. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
 16. Backpropagation algorithm and test the same using appropriate data sets.

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

Total Hours:120

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

1. Update oneself with all the latest changes in the technological world.
2. Become master in one's specialized technology.
3. Analyze and understand the environment of the organization.
4. 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:

1. Understanding the digital marketing concepts and its usefulness in business.
2. Planning steps for digital marketing strategy and successfully executing it.
3. Applying Search Engine Optimization techniques (SEO) and Search Engine Marketing (SEM) to maximize reach and enhance engagement of users.
4. 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:

- *Rajan Gupta, Supriya Madan, “Digital Marketing”, BPB Publication, 1st Edition, 2022*
- *Seema Gupta, “Digital Marketing”, McGraw Hill, 2nd Edition, 2018.*
- *Puneet Singh Bhatia, “Fundamentals of Digital Marketing”, Pearson, 2nd Edition, 2020. Web Sources*
- *https://josephscollege.ac.in/lms/Uploads/pdf/material/DigitalMarketing_Notes.pdf*
- *<https://www.digitalmarketer.com/digitalmarketing/assets/pdf/ultimate-guide-to-digital-marketing.pdf>*

Course Title: Media and digital communication	L	T	P	Cr.
Course Code: BCA 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.

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 Knaflic, C. (2015). *Storytelling with data*. John Wiley & Sons.

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:

1. Understand the various concepts, terminologies and architecture of IoT systems.
2. Use sensors and actuators for design of IoT.
3. Understand and apply various protocols for design of IoT systems
4. 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:

- *Hakima Chaouchi, — “The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Wiley Publications*
- *Olivier Hersent, David Boswarthick, and Omar Elloumi, — “The Internet of Things: Key Applications and Protocols”, Wiley Publications*
- *Vijay Madisetti and Arshdeep Bahga, — “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.*

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:

1. Recognize the various discipline that contribute to a successful data science effort.
2. Understand the processes of data science identifying the problem to be solved, data collection, preparation, modeling, evaluation and visualization.
3. Be aware of the challenges that arise in Data Sciences.
4. Be able to identify the application of the type of algorithm based on the type of the problem.
5. 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:

- *DavyCielen, Arno.D.B.Maysman, Mohamed Ali, “Introducing Data Science” Manning Publications, 2016.*
- *Roger D. Peng, “R Programming for DataScience” Lean Publishing, 2015.*
- *Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014.*
- *Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, “PracticalData Science Cookbook”, Packt Publishing Ltd., 2014.*

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:

1. Evaluate new Hacking Methodology.
2. Install hacking software on a closed network environment.
3. Identify tools and techniques to carry out penetration testing.
4. 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.