GURU KASHI UNIVERSITY

Bachelor of Computer Applications

2023-24

Department of Computer Applications

GRADUATE OUTCOMES OF THE PROGRAMME

The Bachelor of Computer Applications (BCA) program emphasizes computer science principles, proficiency in programming languages, software development techniques, and the cultivation of exceptional problem-solving skills.

PROGRAMME LEARNING OUTCOMES: After completing the programme, the Learner will be able to:

1. Apply exploration to study and analyze problems in different areas of information technology.
2. Analyze and evaluate computing systems, processes, and technologies to identify areas for improvement and optimize their performance.
3. Communicate effectively with different stakeholders using a variety of modes and techniques, including written reports, oral presentations, and visual aids.
4. Contribute to progressive community and society in comprehending computing activities by writing effective reports, designing documentation, making effective presentations, and understanding instructions.
5. Demonstrate proficiency in programming languages, software development tools, and other relevant technologies.
6. Conduct independent research and engage in lifelong learning to keep up-to-date with emerging trends and technologies in computer science.

Programme Structure

Semester I						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
BCA111	Computer Fundamentals	Core	4	0	0	4
BCA112	Programming using C	Core	4	0	0	4
BCA104	Communication skills	Compulsory Foundation	2	0	2	3
BCA113	Computer Fundamentals Lab	Technical skill	0	0	4	2
BCA114	Programming using C Lab	Technical skill	0	0	4	2
BCA199	XXXX	MOOC	-	-	-	2
Disciplinary Elective- I (Any one of the following)						
BCA115	Computer System Architecture	Disciplinary Elective-I	3	0	0	3
BCA116	Digital Electronics					
Total			**13**	**0**	**10**	**20**

Semester II						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BCA211	Operating Systems	Core	4	0	0	4
BCA202	Programming using C++	Core	4	0	0	4
BCA212	Operating Systems Lab	Technical skill	0	0	4	2
BCA204	Programming using C++Lab	Technical skill	0	0	4	2
BCA213	Multimedia Lab	Technical skill	0	0	4	2
BCA214	Environmental Studies	Compulsory Foundation	1	0	0	1
BCA215	Introduction to Human Resource Management	Skill Based	2	0	0	2
BCA218	Gender Equality	Value Added Course	2	0	0	2
Disciplinary Elective- II (Any one of the following)						
BCA216	E- Commerce	Discipline Elective- II	3	0	0	3
BCA217	Information System Design and Implementation					
Total			**16**	**0**	**12**	**22**

Semester III						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BCA311	Database Management Systems	Core	4	0	0	4
BCA312	Data Structures	Core	4	0	0	4
BCA313	Database Management Systems Lab	Technical skill	0	0	4	2
BCA314	Data Structures Lab	Technical skill	0	0	4	2
BCA315	Minor Project	Technical skill	0	0	2	1
BCA399	XXXX	MOOC	-	-	-	2
Disciplinary Elective- III (Any one of the following)						
BCA316	Programming using PHP	Discipline Elective- III	3	0	0	3
BCA317	Application Development using VB.NET					
Open Elective Course						
XXXX		OEC	2	0	0	2
Total			**13**	**0**	**10**	**20**
Open Elective Courses (For other Departments)						
OEC013	Digital Marketing	OEC	2	0	0	2

Semester IV						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BCA409	Programming using Java	Core	4	0	0	4
BCA410	Discrete Mathematics	Core	4	0	0	4
BCA411	Programming using Java Lab	Technical skill	0	0	4	2
BCA412	Internet Fundamentals Lab	Technical skill	0	0	4	2
Disciplinary Elective- IV (Any one of the following)						
BCA413	Theory of Computation	Discipline Elective- IV	3	0	0	3
BCA408	Ethical Hacking					
Disciplinary Elective-V (Any one of the following)						
BCA414	Big Data	Disciplinary Elective-V	3	0	0	3
BCA415	Data Warehouse and Mining					
Value Added Course						
BCA416	Basics of LaTeX	VAC	2	0	0	2
Total			**16**	**0**	**8**	**20**

Semester V						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BCA510	Artificial Intelligence	Core	4	0	0	4
BCA501	Computer Networks	Core	4	0	0	4
BCA511	Artificial Intelligence Lab	Technical skill	0	0	2	1
BCA512	Internship Training* (6 weeks)	Skill Based	-	-	-	6
BCA599	XXXX	MOOC	-	-	-	2
Disciplinary Elective-VI(Any one of the following)						
BCA513	Computer Graphics	Disciplinary Elective-VI	3	0	0	3
BCA514	Parallel Processing					
Total			**11**	**0**	**2**	**20**

Note: * 6 week Training after Fourth Semester during summer vacation

Semester VI						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BCA611	Software Engineering	Core	4	0	0	4
BCA602	Programming using Python	Core	4	0	0	4
BCA605	Programming using Python Lab	Technical skill	0	0	4	2
BCA612	Major Project	Technical skill	0	0	4	2
BCA613	Service Learning	Skill Based	0	0	4	2
Disciplinary Elective-VII (Any one of the following)						
BCA614	Cyber Law	Discipline Elective-VII	3	0	0	3
BCA615	Digital Image Processing					
Disciplinary Elective-VIII(Any one of the following)						
BCA616	Introduction to Cloud Computing	Discipline Elective-VIII	3	0	0	3
BCA617	Analysis & Design of Algorithms					
Total			**14**	**0**	**12**	**20**
Grand Total			81	0	54	120

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]

CA1: Surprise Test (Two best out of three) (10 Marks)

CA2: Assignment(s) (10 Marks)

CA3: Term Paper/Quiz/Presentation (5 Marks)

B. Attendance (5 marks)

C. Mid Semester Test: [30 Marks]

D. End-Term Exam: [40 Marks]

SEMESTER-I

Course Title: Computer Fundamentals

Course Code: BCA111

L	T	P	Credits
4	0	0	4

Total Hours: 60

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 **14 hours**

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

Number System: Bit, byte, binary, decimal, hexadecimal, and octal systems, conversion from one system to the other, representation of characters, integers and fractions.

Binary Arithmetic: Addition, subtraction and multiplication.

Computer Codes: weighted and non-weighted code, BCD, EBCDIC, ASCII, Unicode.

UNIT II **16 hours**

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

Output Devices: Monitors, Printer and its Types.

Memories: Units of Memory, Main Memories - RAM, ROM and Secondary Storage Devices - Hard Disk, Compact Disk, DVD.

UNIT III **14 hours**

Computer languages: Machine language, assembly language, higher level language, 4GL. Introduction to Compiler, Interpreter, Assembler, Assembling, System Software, Application Software.

MS Word: Introduction, Creating & Editing Word Document. Saving Document, Working with Text: Selecting, Formatting, Aligning, Finding Replacing Text, Bullets & Numbering, Header & Footer, Working with Tables, Properties Using spell checker, Grammar, Auto Correct Feature, Graphics: Inserting Pictures, Clip art, Drawing Objects, Setting page size and margins; Printing documents, Mail-Merge.

UNIT IV **16 hours**

MS-Excel: Environment, Creating, Opening & Saving Workbook, Range of Cells, Formatting Cells, Functions: Mathematical, Logical, Date Time, Auto Sum, Formulas. Graphs: Charts. Types & Chart Toolbar, Printing: Page Layout, Header and Footer Tab.

MS PowerPoint: Environment, Creating and Editing presentation, Auto content wizard using built-in templates, Types of Views: Normal, Outline, Slide, Slide Sorter, Slide Show, Creating, customized templates; formatting presentations, AutoShapes, adding multimedia contents, printing slides

Internet: Basic Internet terms: Web Page, Website, Home page, Browser, URL, Hypertext, Web Server, Applications: WWW, e-mail, Instant Messaging, Videoconferencing.

Transaction Mode

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

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: Programming using C
Course Code: BCA112

L	T	P	Credits
4	0	0	4

Total Hours: 60

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. Examine errors handling during program execution.
3. Compare the Union and Structure concept 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 **14 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, goto, for, while, do… while, jumps in loops: break and continue.

UNIT II **16 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 **14 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 **14 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, fprint); argc and argv; File opening modes: Text mode, Binary mode.

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: Communication Skills

Course Code: BCA104

L	T	P	Credits
1	0	0	1

Total Hours: 15

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 **4 hours**

English Language: Sentence, Sentence Formation, Parts of speech, Tenses, Active passive voice, Direct/Indirect speech, Vocabulary.

Business Communication: Definition, Types, Medias, Objectives, Modals, Process and Barriers to communication in an organization & ways to handle and improve barriers of business communication.

UNIT II **4 hours**

Oral Communication: Verbal communication and its types, Non- Verbal Communication and its types.

Listening Skills: Types of listening and Traits of a good listener, Note taking, barriers to listening & remedies to improve listening barriers, Cambridge Tests of listening.

UNIT III **3 hours**

Reading Skills: Newspaper / Magazine/ Article Reading from English Newspaper, Cambridge Readings.

UNIT IV **4 hours**

Writing Skills: Essay Writing, Letter writing: Formal, informal and Job – application, Resume writing.

Presentation Skills: Presentation Purpose in Business world, how to Prepare PPT, Tips for the required body language while delivering the presentation in front of a third party.

Transaction Mode

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

Suggested Readings

- *Kumar, S., &Lata, P. (2011). Communication skills. Oxford University Press.*
- *Training, M. T. D. (2012). Effective communication skills. Bookboon.*

- *Hargie, O. (Ed.). (1986). The handbook of communication skills (p. 37). London: Croom Helm.*

Web Sources

- *https://haiilo.com/blog/top-5-communication-skills-and-how-to-improve-them/*
- *https://corporatefinanceinstitute.com/resources/management/communication/*
- *https://www.thebalancemoney.com/communication-skills-list-2063779*
- *https://www.skillsyouneed.com/ips/communication-skills.html*

Course Title: Computer Fundamentals Lab

Course Code: BCA113

L	T	P	Credits
0	0	6	3

Total Hours: 90

Learning Outcomes

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

1. Compose, format and edit a word document.
2. Understand the concept of email and its applications.
3. Utilize the MS PowerPoint with custom animation and slide orientation.
4. Perform coding in different programs with practical knowledge.

Course Content

List of Experiments **List of Experiments**

1. Formatting experiments:
- Change font styles, sizes, and colors.
- Apply different text formatting options like bold, italic, underline, and strikethrough.
- Adjust paragraph alignment (left, center, right, justified).
- Apply various heading styles and create a table of contents.

2. Table experiments:
- Create a table in Microsoft Word or Excel.
- Adjust column widths and row heights.
- Apply different table styles and formatting options.
- Merge or split cells.
- Sort and filter table data.

3. Formula and calculation experiments:
- Use formulas and functions in Microsoft Excel to perform calculations.
- Experiment with different mathematical operations (+, -, *, /).
- Create complex formulas with multiple functions and cell references.
- Utilize built-in functions like SUM, AVERAGE, MAX, MIN, VLOOUP etc.

4. Collaboration experiments:
- Share a document using Microsoft Word, Excel, or PowerPoint.
- Collaborate with others in real-time on a shared document.
- Track changes made by different users and review or accept/reject them.
- Use comments and annotations to provide feedback or ask questions.

5. Presentation experiments:
- 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.

6. Mail merge experiments:

- Use Microsoft Word's mail merge feature to create personalized documents (e.g., letters, envelopes, labels).
- Connect to a data source (e.g., Excel spreadsheet, Outlook contacts) and merge the data into the document.
- Experiment with different merge fields and formatting options.

Course Title: Programming using C Lab

Course Code: BCA114

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

After completion of this 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 reverse a string
28. Write a program to multiply two numbers using pointers.
29. Write a program to display address of variable using pointers
30. Write a program to show the memory occupied by structure and union.
31. Write a program to create student i-card using a structure
32. Write a program to read data from a file from a file
33. Write a program to save employee details in a file using file handling

Course Title: Computer System Architecture
Course Code: BCA115

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Knowledge about the architecture of the central processing unit.
2. Attain the knowledge of memory hierarchy.
3. Exemplify various data transfer modes.
4. Know about the concepts of Memory mapping and Cache memory.

Course Content

UNIT I **14 hours**

Computer System Organisation: CPU Organisation, Instruction Execution (instruction cycle, types of instructions), RISC v/s CISC, Design Principles for Modern Computers, Instruction level parallelism. Processor level parallelism.

Primary memory: Memory addresses, Byte Ordering, Error-correcting codes, Cache memory. Secondary memory: Memory hierarchy, SCSI disk, RAID.

UNIT II **16 hours**

Instruction Set Architecture: Instruction formats, Expanding opcodes, types of addressing modes, data transfer and manipulation instructions, Program control(status-bit conditions, conditional branch instructions, program interrupt, types of interrupt).

UNIT III **14 hours**

Register Transfer Language: Register Transfer, Bus and memory transfer, Arithmetic micro operations, Logic micro-operations, Shift micro-operations, Arithmetic logic sift unit Microprogrammed control, control word, control memory (concepts only) .

UNIT IV **16 hours**

Input-output Organization- I/O interfaces (I/O bus and interface modules, I/O versus memory bus, isolated versus memory-mapped I/O). Asynchronous Data transfer (strobe control, handshaking), modes of transfer (programmed I/O, interrupt-initiated I/O, software considerations), direct memory access.

Transactional Mode

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

Suggested Readings

- *Mano, M. M. (1993). Computer system architecture. Prentice-Hall, Inc.*
- *Balch, M. (2003). Complete digital design: a comprehensive guide to digital electronics and computer system architecture. McGraw-Hill Education.*

- *Parhami, B. (2005). Computer architecture. Oxford University Press, New York, NY, USA.*

Web Sources

- *https://www.studytonight.com/computer-architecture/input-output-organisation*
- *https://www.javatpoint.com/computer-organization-and-architecture-tutorial*
- *https://429151971640327878.weebly.com/blog/13-computer-system-architecture*
- *https://www.geeksforgeeks.org/microarchitecture-and-instruction-set-architecture/*

Course Title: Digital Electronics
Course Code: BCA116

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

After completion of this 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.*

Web Sources

- *https://www.javatpoint.com/digital-electronics*
- *https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/*
- *https://www.tutorialspoint.com/digital_circuits/index.htm*
- *https://byjus.com/physics/digital-electronics/*

Semester II

Course Title: Operating Systems

Course Code: BCA211

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

After completion of this 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 **14 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 (FCSC, SJF, Round-Robin, Multilevel Queue).

UNIT II **16 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 **14 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 **16 hours**

Advanced Operating systems: Introduction to Distributed Operating system, Characteristics, architecture, Issues, Communication & Synchronization; Introduction Multiprocessor Operating system, Architecture, Structure, Synchronization & Scheduling; Introduction to

Real-Time Operating System, Characteristics, Structure & Scheduling. Case study of Linux operating system.

Transactional Mode

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

Suggested Readings

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

Web Sources

- *https://www.guru99.com/operating-system-tutorial.html)*
- *https://www.tutorialspoint.com/operating_system/os_overview.htm)*
- *https://www.javatpoint.com/operating-systemand Functions - javatpoint*
- *https://www.howtogeek.com/361572/what-is-an-operating-system/ (howtogeek.com)*

Course Title: Programming using C++

Course Code: BCA202

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

After completion of this 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 **14 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 **14 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, In line functions, default arguments, const arguments, function overloading, Friend functions, Objects as function arguments, friendly functions, 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 **14 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 **14 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.*

Web Search

- *https://www.w3schools.com/cpp/cpp_intro.asp#:~:text=C%2B%2B%20is%20an%20object%2Doriented,fun%20and%20easy%20to%20learn!*
- *https://www.geeksforgeeks.org/c-plus-plus/*
- *https://www.programiz.com/cpp-programming*
- *https://www.javatpoint.com/cpp-tutorial*

Course Title: Operating System Lab

Course Code: BCA212

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

After completion of this 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. Apply the process of installing standard libraries on an 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: Programming using C++ Lab
Course Code: BCA204

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

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

1. Classify the object oriented concepts and their implementation.
2. Use the concepts of array and string using C++.
3. Implement a given program solved by C++.
4. Grasp the concept of implementing the constructors with classes.

Course Content

1. Write a program to print

1
12
123
1234
123452

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: Multimedia Lab

Course Code: BCA213

L	T	P	Credits
0	0	4	2

Total Hours: 60

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. 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: Environmental Studies
Course Code: BCA214

L	T	P	Credits
1	0	0	1

Total Hours: 15

Learning Outcomes

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

1. Acquire the basic knowledge of Environment study.
2. Demonstrate an understanding of ecosystems and their functions.
3. Examine the individual's role in pollution prevention.
4. Evaluate the impact of information technology on the environment and human health.

Course Content

UNIT I **4 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 **3 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 **4 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 **4 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.*

Web Sources

- *https://leverageedu.com/blog/multidisciplinary-nature-of-environmental-studies/*
- *https://study.com/learn/lesson/web-presence-overview-importance.html*

Course Title: Introduction to Human Resource Management	L	T	P	Credits
Course Code: BCA215	2	0	0	2

Course Content **Total Hours: 30**

Learning Outcomes

After completion of this 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 **8 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 **9 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 **6 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 **7 hours**

Grievance and Discipline: Meaning, Definition and Nature of Grievance Procedure-Grievance Machinery.

Definition of Discipline-Aim and Objective of Discipline. Principle of Discipline.

Transactional Mode

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

Suggested Readings

- 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

Web Sources

- https://www.shrm.org/
- https://onlinelibrary.wiley.com/journal/17488583

Course Title: E-Commerce
Course Code: BCA216

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Discuss about the basic concepts and technologies used in the field of E-Commerce and Governance.
2. Apply their knowledge of various Electronic Payment Systems in practical scenarios.
3. Analyze and differentiate between various Governance Process Models.
4. Evaluate Internet trading relationships, including Business-to-Consumer (B2C), Business-to-Business (B2B), and Intra-organizational dynamics

Course Content

UNIT I **12 hours**

Introduction to e-commerce: History of e-commerce, e-business models B2B, B2C, C2C, C2B, legal; environment of e-commerce, ethical issues, electronic data interchange, value chain and supply chain, advantages and disadvantages of e-commerce.

Electronic Payment Systems: Credit cards, debit cards, smart cards, e-credit accounts, e-money, Marketing on the web, marketing strategies, advertising on the web, customer service and support, introduction to m-commerce, case study: e-commerce in passenger air transport.

UNIT II **10 hours**

E-Government, theoretical background of e-governance, issues in e-governance applications, evolution of e-governance, its scope and content, benefits and reasons for the introduction of e-governance, e-governance models- broadcasting, critical flow, comparative analysis, mobilization and lobbying, interactive services / G2C2G.

UNIT III **11 hours**

E-readiness, e-government readiness, E- Framework, step & issues, application of data warehousing and data mining in e-government, Case studies: NICNET-role of nationwide networking in e-governance, e-seva.

UNIT IV **12 hours**

E-Government systems security: Challenges and approach to e-government security, security concern in e-commerce, security for server computers, communication channel security, security for client computers.

Transaction Mode

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

Suggested Readings

- *Winn, J. K., & Wright, B. (2000). The law of electronic commerce. Wolters Kluwer.*
- *United States. White House Office. (1997). A framework for global electronic commerce. White House.*
- *Andrea, G. (Ed.). (2002). Development Centre Studies Electronic Commerce for Development. OECD Publishing.*

Web Sources

- *https://simplycoding.in/e-commerce-and-e-governance-notes/*
- *https://study.com/academy/lesson/what-is-e-government-commerce-definition-examples.html*
- *https://www.geeksforgeeks.org/e-governance/*
- *https://web.archive.org/web/20160103054145/http://www.isoc.org/inet96/proceedings/g7/g7_3.htm*

Course Title: Information System Design & Implementation

Course Code: BCA217

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

1. After completion of this course, the learner will be able to:
2. Understand the various aspects of Information Systems analysis and design.
3. Identify prerequisites for software development and comprehend associated paradigms.
4. Apply analytical and design principles to create effective information systems.
5. Analyze and document user requirements for information systems.

Course Content

UNIT I **10 hours**

Systems Concepts and Information Systems Environment: Definition and characteristics of a system. Elements of a system Environment: Boundaries and interface. Types of systems: Physical or Abstract Systems, Open and Closed System, Man - made information systems.

The System Development Life Cycle: Introduction to various phases- Recognition of Need, Feasibility Study, Analysis, Design, Implementation, Post– Implementation and Maintenance.

The Role of System Analyst: Skills of a System Analyst, various roles of the Analyst.

UNIT II **12 hours**

System Planning and the Initial Investigation: Bases for planning in system analysis, Initial investigation, determining the user's information requirements, Problem definition and Project Initiation, Background Analysis, Fact Finding, Fact Analysis, Determination of Feasibility.

Information Gathering: Introduction, Information Gathering tools: Review of Literature, Procedures and forms. On -site observation. Interviews and questionnaires.

Tools of Structured Analysis: Various tools of structured analysis: Data flow diagram (DFD), Data Dictionary, Decision tree and structured English, Decision table, Pros and cons of each tool.

UNIT III **12 hours**

Feasibility Study: System Performance-statement of Constraints, Identification of Specific System Objectives, description of Outputs. Feasibility Study – Feasibility considerations, Steps in feasibility analysis. Feasibility Report.

System Design: The Process of Design-Logical and Physical Design, Design methodologies: Structured design, Functional Decomposition.

System Testing and Quality Assurance: Testing, System testing, Quality assurance and its goals in its system life cycle, Levels of quality assurance, Trends in testing.

UNIT IV **11 hours**

Implementation and Software Maintenance: Introduction, Conversion-Activity network for Conversion, File Conversion, User Training: Elements of user Training Post implementation review. Software Maintenance - Primary activities of a Maintenance Procedure, Reducing Maintenance Costs.

Hardware and Software Selection: Types of Software, Procedure for Hardware/Software selection: Major phases in selection, Evaluation and Validation, Vendor Selection, Post – Installation Review. Software selection- Criteria for Software Selection, the evaluation process.

Transactional Mode

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

Suggested Readings

- *E.M. Awad: Systems Analysis and Design,Galgotia Publications(P)Ltd.*
- *Hardgrave Bill C. ,Siau Keng, Chiang Roger H.L., Systems Analysis and Design : Techniques, Methodologies, Approaches and Architectures 1st Edition, M.E. Sharpe Publications.*

Web Sources

- *https://egyankosh.ac.in/bitstream/123456789/25561/1/Unit-2.pdf*
- *https://www.tutorialspoint.com/system_analysis_and_design/system_analysis_and_design_overview.htm*
- *https://www.gpp7.org.in/wp-content/uploads/sites/22/2020/04/file_5e95e008f2daf.pdf*

Semester III

Course Title: Database Management System
Course Code: BCA311

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Identify the difference about database systems from the file systems by enumerating their features.
2. Recognize and appreciate the role of a database administrator.
3. Demonstrate proficiency in both physical and logical database design.
4. Translate an Entity-Relationship diagram into a Relational Schema accurately.

Course Content

UNIT I **14 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 **16 hours**

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

UNIT III **14 hours**

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

UNIT IV **16 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.KorthF. 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.*

Web Sources

- *https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/*
- *https://www.javatpoint.com/dbms-tutorial*
- *https://www.techopedia.com/definition/24361/database-management-systems-dbms*

Course Title: Data Structure
Course Code: BCA312

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

After completion of this 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. Evaluate and choose appropriate searching and/or sorting techniques for various problem types and data structures.
4. Differentiate and classify different types of data structures based on their characteristics and use cases.

Course Content

UNIT I **14 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 **16 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 **14 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 **16 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.*

Web Search

- *https://www.geeksforgeeks.org/data-structures/*
- *https://www.javatpoint.com/data-structure-tutorial*
- *https://www.programiz.com/dsa/data-structure-types*
- *https://www.techtarget.com/searchdatamanagement/definition/data-structure*

Course Title: Database Management Systems Lab

Course Code: BCA313

L	T	P	Credits
0	0	4	2

Total Hours: 60

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: Data Structures Lab

Course Code: BCA314

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

After completion of this 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: Minor Project

Course Code: BCA315

L	T	P	Credits
0	0	2	1

Total Hours:30

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: Programming using PHP
Course Code: BCA316

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Implement the PHP basics i.e. web server, Text editor (Sublines, Dreamweaver).
2. Demonstrate about the concept of operators, Conditional and loops.
3. Develop the functional PHP script.
4. Introduce the creation of static webpage using HTML.

Course Content

UNIT I **12 hours**

Introduction to PHP: PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.), PHP with other, technologies, scope of PHP, Basic Syntax, PHP variables and constants, Types of data in PHP, Expressions, scopes of a variable (local, global), PHP Operators: Arithmetic, Assignment, Relational, Logical operators, Bitwise, ternary and MOD operator, PHP operator Precedence and associativity.

UNIT II **11 hours**

Handling HTML form with PHP: Capturing Form Data, GET and POST form Methods Dealing with multi value fields, redirecting a form after submission.

PHP conditional events and Loops: PHP IF Else conditional statements (Nested IF and Else), Switch case, while, For and Do While Loop, Goto, Break, and Continue and exit

UNIT III **10 hours**

PHP Functions: Function, Need of Function, declaration and calling of a function, PHP Function with arguments, Default Arguments in Function, Function argument with call by value, call by reference, Scope of Function Global and Local.

UNIT IV **12 hours**

String Manipulation and Regular Expression: Creating and accessing String, Searching & Replacing String, Formatting, joining and splitting String, String Related Library functions, Use and advantage of regular expression over inbuilt function, Use of preg_match(), preg_replace(), preg_split() functions in regular expression.

Transactional Mode

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

Suggested Readings

- *Lerdorf, R., Tatroe, K., Kaehms, B., &McGredy, R. (2002). Programming Php. " O'Reilly Media, Inc.".*
- *Lerdorf, R., Tatroe, K., &MacIntyre, P. (2006). Programming Php. " O'Reilly Media, Inc.".*
- *Tatroe, K., &MacIntyre, P. (2020). Programming PHP: Creating dynamic web pages. O'Reilly Media.*

Web Sources

- *https://www.w3schools.com/php/*
- *https://www.tutorialspoint.com/php/php_introduction.html*
- *https://www.javatpoint.com/php-tutorial*

Course Title: Application Development using VB.NET

Course Code: BCA317

L	T	P	Credits
3	0	0	3

Total Hours 45

Learning Outcomes

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

1. Demonstrate proficiency in using variables, data types, and control flow structures in VB.NET.
2. Apply event handling techniques to respond to user actions and input
3. Connect to databases and retrieve data using VB.NET.
4. Implement data manipulation operations, such as inserting, updating, and deleting records.

Course Content

UNIT I **10 hours**

Overview of the Visual Studio .NET IDE: Introduction to .NET Framework and the Common Language Runtime, Introduction to Visual tudio.NET IDE: Menu Bar and Tool Bar, Solution Explorer, Toolbox, using different controls of Toolbox and their commonly used properties and methods: Textbox, Label, Check Box, Radio Button, Button, Frame, List Box, Combo Box, Picture, Image, Shape, Drive, File, directory related controls, Introduction to Menus

UNIT II **12 hours**

Basics of VB.Net: Constants, Variables, data types, assignment operator, Operators: Arithmetic, Relational and logical operators, Assignment operators, Control structures: If, if/then/else selection structures, select case Multiple-selection structure, While, do while, do until, For/Next repetition structure.

Procedures: Introduction, sub Procedures, function procedures, event procedures, commonly used Form events, msgBox function, InputBox function.

Arrays and Strings: declaring and allocating Arrays, Using Strings and String functions: len, right, left, ucase, lcase, ltrim, trim;

Control Arrays: Introduction, creating and using Control Arrays

UNIT III **12 hours**

Writing ASP .NET applications and Deploying ASP .NET Applications: Introduction to ASP.NET, Difference between ASP and ASP.NET, Understanding Web Forms, Using

Validation Controls: Required Field Validator, Range Validator, Compare Validator, Regular Expression Validator, Custom Validator, Validation Summary, Managing State in ASP.NET Web Applications using Session object, Cookie and Query String, Creating ASP.NET application, Deploying

ASP.NET Applications with Windows Installer, Introduction to Web Services.

UNIT IV **11 hours**

Accessing Data with ADO.NET: Understanding ADO.net, ADO.NET Object model: Connected model and Disconnected model, architecture, components, Understanding

Provider classes, using Data Reader to read data from database, Data Adapter and Data sets, Using Data Adapter for Data Navigation and Data Manipulation, connecting to and querying a data source, using Data Grid view control with ADO.NET data sources.

Transactional Mode

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

Suggested Readings

- *Dave Grundgeiger, Programming Visual Basic .NET, O'Reilly Publisher.*
- *Michael McMillan, Object Oriented programming using Visual Basic.Net, Cambridge University Press.*
- *Cameron Wakefield Henk-Evert Sonder Wei Meng Lee, VB.NET Developer's Guide, Global Knowledge, Syngress Publishing.*
- *Evangelos Petroutsos, Mastering Visual Basic .NET, SYBEX Publishing*
- *Deitel, Visual Basic.NET How to Program, Pearson Education*
- *Lowell Mauer, Teach Yourself more Visual Basic.net in 21 days, SAMS*

Web Sources

- *https://www.javatpoint.com/vb-net*
- *https://www.tutorialspoint.com/vb.net/index.htm*
- *https://www.geeksforgeeks.org/introduction-to-net-framework/*

Course Title: Digital Marketing
Course Code: OEC013

L	T	P	Credits
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 Media Marketing.

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 Off-Page 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 hour**

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, Ist 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/digital-marketing/assets/pdf/ultimate-guide-to-digital-marketing.pdf*

Semester IV

Course Title: Programming using Java
Course Code: BCA409

L	T	P	Credits
4	0	0	4

Total Hours: 60

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 **14 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 **16 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, labelled loops, Jumping Statements.

UNIT III **14 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 **16 hours**

Interfaces: Introduction, Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables, Implementing Multiple Inheritance using Interfaces.

Packages: Introduction; System Packages, Using System Packages, Naming Conventions, Creating Packages, accessing a Package, using a Package, Adding a Class to a Package, Hiding Classes.

Managing Errors and Exceptions: Introduction; Types of Errors; Exceptions, Exception Handling using Try, Catch and Finally block: Throwing Our Own Exceptions, Using Exceptions for Debugging.

Applet Programming: Introduction; How Applets Differ from Applications; Applet Life Cycle; Creating an Executable Applet

Transactional Mode

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

Suggested Readings

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

Web Sources

- *https://www.javatpoint.com/java-tutorial*
- *https://www.geeksforgeeks.org/introduction-to-java/*
- *https://www.geeksforgeeks.org/interfaces-in-java/*
- *https://www.geeksforgeeks.org/classes-objects-java/*

Course Title: Discrete Mathematics
Course Code: BCA410

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

After completion of this 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 **14 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 **16 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 **14 hours**

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

UNIT IV **16 hours**

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

Trees: Introduction, Binary Trees, Complete and Extended Binary Trees, Representing Binary Trees in Memory, Traversing Binary Trees, Binary Search Trees

Transactional Mode

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

Suggested Readings

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

Web Sources

- *https://www.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 Java Lab
Course Code: BCA411

L	T	P	Credits
0	0	4	2

Total Hours: 60

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: Internet Fundamentals Lab

Course Code: BCA412

L	T	P	Credits
0	0	4	2

Total 60 Hours

Learning Outcomes

On successful completion of the course, students 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. Demonstrate the use of networking tools like ping, ipconfig, netstat and traceroute.
2. Configure a web-server on a personal system.
3. Demonstrate the network monitoring of the internet traffic through any predefined tool
4. Develop an interactive website using jquery, JSON, NODE.js and BOOTSTRAP with following functionalities.
5. Design a home page and other allied pages of the website using HTML and CSS

1) Create a registration form and insert the data into tables at the backend. Creating an html form with content validation using JavaScript.
2) Handle HTML form using jQuery, store the data in JSON objects, pass them to another page and display it there using jQuery
3) Logging system to manage various types of accounts
4) Create pages with dynamic content fetching and display
5) Perform event handling in node.js

Course Title: Theory of Computation

Course Code: BCA413

L	T	P	Credits
3	0	0	3

Total Hours: 45

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 **11 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 **12 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 **11 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 **11 hour**

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.*

Web Sources

- *https://www.geeksforgeeks.org/introduction-of-theory-of-computation/*
- *https://www.javatpoint.com/automata-tutorial*
- *https://www.tutorialspoint.com/what-is-the-theory-of-computation*
- *https://www.w3schools.com/ai/ai_history_computers.asp*

Course Title: Ethical Hacking

Course Code: BCA408

L	T	P	Credits
3	0	0	3

Total Hours: 45

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 **12 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 **10 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 **10 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 **13 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 Modes

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

Suggested Readings

- *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.*

Web Sources

- *https://www.javatpoint.com/ethical-hacking#:~:text=Ethical%20hacking%20involves%20an%20authorized%20attempt%20to%20gain,hackers%20improve%20the%20security%20posture%20of%20an%20organization.*
- *https://www.bing.com/ck/a?!&&p=075f840600d8da28JmltdHM9MTY4MzUwNDAwMCZpZ3VpZD0yYzYwNzgyMS05YmI2LTY0ZDItMDJmNi02OGJmOWEyZDY1NjkmaW5zaWQ9NTIwMw&ptn=3&hsh=3&fclid=2c607821-9bb6-64d2-02f6-68bf9a2d6569&psq=%e2%80%a2EthecaL+HACKIN&u=a1aHR0cHM6Ly93d3cuamF2YXRwb2ludC5jb20vZXRoaWNhbC1oYWNraW5n&ntb=1*

Course Title: Big Data
Course Code: BCA414

L	T	P	Credits
3	0	0	3

Total Hours: 45

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 **14 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 **09 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 **10 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 **12 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 derooset 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.*

Web Sources

- *https://www.javatpoint.com/what-is-big-data*
- *https://www.guru99.com/what-is-big-data.html*
- *https://www.geeksforgeeks.org/what-is-big-data/*
- *https://cloud.google.com/learn/what-is-big-data*

Course Title: Data Warehouse and Mining
Course Code: BCA415

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Identify the scope and necessity of Data Mining & Warehousing for the society.
2. Describe the designing of Data Warehousing so that it can be able to solve the root problems.
3. Get knowledge of various tools of Data Mining and their techniques to solve the real time problems.
4. Develop a data mining application for data analysis using various tools.

Course Content

UNIT I **10 hours**

Introduction: What is Data Mining, Data Mining Functionalities, Classification of Data Mining Systems, and Major Issues in Data Mining. Data Preprocessing: Needs Preprocessing, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

UNIT II **12 hours**

Data Warehouse and OLAP Technology: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture and Implementation, from Data Warehousing to Data Mining. Frequent Patterns, Associations Rules: Basic Concepts, Efficient and Scalable Frequent Item Set Mining Methods, Mining various kinds of Association Rules.

UNIT III **11 hours**

Classification and Prediction: Introduction, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, and Rule based Classification, Classification by Back Propagation, Support Vector Machines, Prediction, Accuracy and Error Measures.

UNIT IV **12 hours**

Cluster Analysis: Introduction, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, and Grid Based Methods; Model Based Clustering Methods, Outlier Analysis.

Transactional Mode

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

Suggested Readings

- *Dunham Margaret H, Sridhar S. (2008). Data mining: Introductory and Advanced Topics, Pearson Education.*
- *HumphiresH.D.(2009).Data Warehousing: Architecture and Implementation Pearson Education.*
- *AnahoryM.(2008). Data Warehousing in the Real World. Pearson Education.*

Web Sources

- *https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing*
- *https://www.ibm.com/topics/data-warehouse*
- *https://www.geeksforgeeks.org/difference-between-data-warehousing-and-data-mining/*
- *https://www.investopedia.com/terms/d/data-warehousing.asp*

Course Title: Basics of LaTeX

Course Code: BCA416

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes:

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

1. Gain a basic knowledge of LaTex.
2. Learn to add images and mathematical equations.
3. Use various packages of LaTex.
4. Apply various applications in teaching and research.

Unit-I **8 Hours**

Installation of the software LaTeX, Understanding LaTeX compilation and LaTeX editors, Basic syntax, Writing mathematical equations, Matrices, Tables, Inclusion of graphics into LaTeX file.

Unit-2 **8 Hours**

Page configurations: Title, Abstract, Keywords, Chapter, Sections and Subsections, References and their citations, labeling of equations, Table of contents, List of figures, List of tables, Page numbering, Generating index.

Unit-3 **6 Hours**

Packages: amsmath, amssymb, amsthm, amsfonts, hyperrefer, graphic, color, xypic, latexsym, natbib, setspace, multicol, suBCAption, url, verbatim, tikz, and geometry. Classes: Article, Report, Book, Letter, Slides, Beamer.

Unit-4 **8 Hours**

Applications to: Writing reports, books, articles/ research papers, thesis, and official letters. Making simple and modern resumes, figures, question papers, and presentations.

Suggested Readings

- *L. Lamport. LATEX: A Document Preparation System, User's Guide and Reference Manual. 2nd Edition, Addison Wesley, New York, 1994.*
- *D. F. Griffiths and D. J. Higham, Learning LaTex, 2nd Edition, Philadelphia, Pensylvania, SIAM, 1997.*

Web Sources

- *https://www.overleaf.com*
- *https://www.sharelatex.com/*

Semester V

Course Title: Artificial Intelligence
Course Code: BCA510

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

On successful completion of this course, students 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.*

Web Sources

- *https://www.vssut.ac.in/lecture_notes/lecture1428643004.pdf*
- *https://mrcet.com/downloads/digital_notes/IT/(R17A1204)%20Artificial%20Intelligence.pdf*
- *https://www.cet.edu.in/noticefiles/271_AI%20Lect%20Notes.pdf*

Course Title: Computer Networks
Course Code: BCA501

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Get knowledge about the layers of the OSI model and TCP/IP.
2. Compare and identify various network topologies.
3. Identify the types of application process protocols.
4. Discuss the various data link layers and network protocols.

Course Content

UNIT I **14 hours**

Data communications concepts: Digital and analog parallel and serial synchronous and asynchronous, simplex, half duplex, full duplex, multiplexing.

Communication channels: Wired transmissions: Telephone lines, leased lines, switch line, coaxial cables, base band, and broadband, optical fiber transmission.

UNIT II **16 hours**

Wireless transmission: Microwave transmission, infrared transmission, laser transmission, radio transmission, and satellite transmission, Communication switching techniques; Circuit switching, message switching, packet switching.

UNIT III **14 hours**

Network reference models: Network topologies, OSI references model, TCP/IP reference model, comparison of OSI and TCP reference model. Data link layer design issue: Services provided to the network layer, framing, error control, flow control, HDLC, SDLC, data link layer in the internet (SLIP, PPP).

UNIT IV **16 hours**

MAC sub layer: CSMA/CD, IEEE standards, FDM, TDM, CDMA.

The Network Layer: Design Issues,

Routing Algorithms: Optimality principled, shortest path routing, Concept of Internet Working.

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. S. (2002). Computer networks. Pearson Education India.*
- *Peterson, L. L., & Davie, B. S. (2007). Computer networks: a systems approach. Elsevier.*

- *Kiesler, S. (1986). The hidden messages in computer networks (pp. 46-47). Harvard Business Review Case Services.*

Web Sources

- *https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/*
- *https://www.studytonight.com/computer-networks/reference-models-in-computer-networks*
- *https://www.bing.com/ck/a?!&&p=2b949258678ed6ceJmltdHM9MTY4MzUwNDAwMCZpZ3VpZD0yYzYwNzgyMS05YmI2LTY0ZDItMDJmNi02OGJmOWEyZDY1NjkmaW5zaWQ9NTIxMQ&ptn=3&hsh=3&fclid=2c607821-9bb6-64d2-02f6-68bf9a2d6569&psq=cOMPUTER+nETWORKS&u=a1aHR0cHM6Ly93d3cuamF2YXRwb2ludC5jb20vY29tcHV0ZXItbmV0d29yay10dXRvcmlhbA&ntb=1*

Course Title: Artificial Intelligence Lab
Course Code: BCA511

L	T	P	Credits
0	0	2	1

Total Hours: 30

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.
13. 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.
14. 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.
15. Write a Prolog program to implement maxlist(L, M) so that M is the maximum number in the list.
16. 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.
17. 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.
18. 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: Internship Training

Course Code: BCA512

L	T	P	Credits
			6

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: Computer Graphics
Course Code: BCA513

L	T	P	Credits
3	0	0	3

Total Hours: 45

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 **12 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. Graphics Monitors and Workstations, Input Devices, Hard-copy devices, Graphics Software.

UNIT II **11 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 **11 hours**

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

UNIT IV **11 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.*

Web Sources

- *https://www.javatpoint.com/computer-graphics-tutorial*
- *https://www.geeksforgeeks.org/introduction-to-computer-graphics/*
- *https://www.coursera.org/articles/computer-graphics*

Course Title: Parallel Processing
Course Code: BCA514

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Understand, appreciate and apply parallel and distributed algorithms in problem.
2. Evaluate the impact of network topology on parallel/distributed algorithm.
3. Gain hand-on experience with the distributed programming techniques.
4. Master skills to measure the performance of parallel and distributed programs.

Course Content

UNIT I **12 hours**

Introduction: Definition of PP, Feature of PP, Advantages and disadvantages of PP, Synchronous - vector/array, SIMD, MIMD.
Hardware taxonomy: Flynn's classifications, Handler's classifications.

UNIT II **11 hours**

Abstract parallel computational models: Combinational circuits, Sorting network, PRAM models,
Performance Metrics: Laws governing performance measurements. Matrices - speedups, efficiency, communication overheads.

UNIT III **11 hours**

Parallel Processors: Taxonomy and topology - shared memory multiprocessors, distributed memory networks.
Parallel Programming: Shared memory programming, distributed memory programming, object oriented programming, functional programming.

UNIT IV **11 hours**

Scheduling and Parallelization: Scheduling parallel programs. Parallelization of sequential programs. Parallel programming support environments.

Suggested Readings

- *M. J. Quinn. Parallel Computing: Theory and Practice , McGraw Hill, New York, 1994.*
- *T. G. Lewis and H. El-Rewini. Introduction to Parallel Computing , Prentice Hall, New Jersey, 1992.*
- *T. G. Lewis. Parallel Programming: A Machine-Independent Approach , IEEE Computer Society Press, Los Alamitos, 1994.*

Web Sources

- *https://www.javatpoint.com/parallel-processing*
- *https://www.geeksforgeeks.org/what-is-parallel-processing/*
- *https://www.sciencedirect.com/topics/computer-science/parallel-processing*

Semester VI

Course Title: Software Engineering
Course Code: BCA611

L	T	P	Credits
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.*

Web Sources

- *https://www.simplilearn.com/tutorials/devops-*
- *https://www.geeksforgeeks.org/software-engineering-software-characteristics/*
- *https://www.bing.com/ck/a?!&&p=69e83b0e8aeb7214JmltdHM9MTY4MzUwNDAwMCZpZ3VpZD0yYzYwNzgyMS05YmI2LTY0ZDItMDJmNi02OGJmOWEyZDY1NjkmaW5zaWQ9NTI3Ng&ptn=3&hsh=3&fclid=2c607821-9bb6-64d2-02f6-68bf9a2d6569&psq=software+engineering&u=a1aHR0cHM6Ly93d3cuZ2Vla3Nmb3JnZWVrcy5vcmcvc29mdHdhcmUtZW5naW5lZXJpbmcv&ntb=1*

Course Title: Programming using Python
Course Code: BCA602

L	T	P	Credits
4	0	0	4

Total Hours: 60

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 the basics of Strings and Dictionaries.

Course Content

UNIT I **16 hours**

Introduction to Python Getting Started: Introduction to Python- an interpreted high level language, interactive mode and script mode.

Variables, Expressions and Statements: Values, Variables and keywords; Operators and Operands in Python: (Arithmetic, relational and logical operators), operator precedence, Expressions and Statements (Assignment statement); Taking input (using raw_input() and input()) and displaying output(print statement);Putting Comments.

UNIT II **14 hours**

Conditional constructs and looping: if else statement While, for (range function), break, continue, else, pass, Nested loops, use of compound expression in conditional constructs and looping

Functions: Importing Modules (entire module or selected objects), invoking built in functions, functions from math module, using random () and randint() functions of random module to generate random numbers, composition.

Defining functions, invoking functions, passing parameters, scope of variables, void functions and functions returning values, flow of execution.

UNIT III **14 hours**

Strings: Creating, initializing and accessing the elements; String operators: +, *, in, not in, range slice [n:m]; Comparing strings using relational operators; String functions & methods: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitile, partition, replace, join, split, count, decode, encode, swapcase, Pattern Matching.

Lists: Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements; List operations (joining, list slices); List functions & methods: len, insert, append, extend, sort, remove, reverse, pop

Dictionaries: Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, traversing, appending, updating and deleting

elements. Dictionary functions & Methods: cmp, len, clear(), get(), has_key(), items(), keys(), update(), values().

UNIT IV **16 hours**

Tuples: Immutable concept, creating, initializing and accessing the elements in a tuple; Tuple functions:cmp(), len(), max(), min(), tuple()
Input and Output: Output Formatting, Reading and Writing Files
Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Predefined Clean-up Actions.

Transactional modes

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

Suggested Readings

- *Guttag, J. V. (2013). Introduction to computation and programming using Python. Mit Press.*
- *Guttag, J. V. (2016). Introduction to computation and programming using Python: With application to understanding data. MIT Press.*
- *Langtangen, H. P., & Langtangen, H. P. (2011). A primer on scientific programming with Python (Vol. 1). Berlin/Heidelberg: Springer.*

Web Sources

- *https://www.toppr.com/guides/computer-science/programming-withpython/tuples/immutabletuples/#:~:text=These%20tuples%20are%20an%20ordered,can%20call%20them%20immutable%20tuples.*
- *https://www.w3schools.com/python/gloss_python_join_lists.asp*
- *https://www.w3schools.com/python/*
- *https://www.geeksforgeeks.org/python-programming-language/*

Course Title: Programming using Python Lab

Course Code: BCA605

L	T	P	Credits
0	0	4	2

Total Hours: 60

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: 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: Major Project Lab
Course Code: BCA612

L	T	P	Credits
0	0	4	2

Total Hours: 60

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)
2. **Note: The marks distribution for the practical will be as under**

a. Viva Voce 10 marks
b. System development 30

Course Title: Service Learning
Course Code: BCA613

L	T	P	Credits
0	0	4	2

Total Hours: 60

Course Content

This course aims to engage students in meaningful service-learning activities that foster community linking. Students will actively participate in community-based projects, collaborate with community members and organizations, and reflect on the impact of their service activities. Through this experiential learning approach, students will develop a deep Analyzing of community needs, build relationships with diverse stakeholders, and contribute to community development.

In this course, students are expected to have a presence in the community throughout the semester and reflect on their experiences regularly. In these reflections, they use course content as a basis for their analysis and Analyzing of the key theoretical, methodological and applied issues at hand.

Transaction Mode

Problem solving learning, blended learning, Cooperative learning, Inquiry based learning, Visualization, Group discussion, experiential learning, Active participation

Suggest Reading

- *"Service-Learning in Higher Education: Concepts and Practices" by Barbara Jacoby.*
- *"Learning Through Serving: A Student Guidebook for Service-Learning and Civic Engagement Across Academic Disciplines and Cultural Communities" by Christine M. Cress, Peter J. Collier, and Vicki L. Reitenauer.*
- *"Reflection: Turning Experience into Learning" by David Boud, Rosemary Keogh, and David Walker.*

"The Community Engagement Professional in Higher Education: A Competency Model for an Emerging Field" by Lina D. Dostilio.

Course Title: Cyber Law
Course Code: BCA614

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Analyze the concept of cybercrimes.
2. Knowledge about the regulation of cyberspace at national and international level.
3. Describe the international legal regime related to cybercrimes.
4. Discuss the scope of consumer protection in e-commerce.

Course Content

UNIT I **13 hours**

General introduction and Cyber space regulations: CyberSpace-Meaning and characteristics Need for regulation of cyberspace, Cyber-libertarianism, Cyber-paternalism, Lessing's model of regulation, Regulators in cyberspace, Introduction to Internet, ACLU v Reno, Digitization and Society, Legal Challenges of the Information Society, Information Technology Act, 2000.

UNIT II **10 hours**

Cyber law and IPR issues: Digital Copyrights, Open Source, Linking and caching, Digital Rights Management, DMCA, - Patents, Software Patents Trademarks and domain names, Brand identities, search engines and secondary market, ICANN, Database Right.

UNIT III **10 hours**

Cyber law and privacy and taxations issues: Digitization, personal data and data industry, Data protection principles, Conditions for processing of personal data, CCTV, RFID tracking, Data retention and identity - Taxation issues of e-commerce.

UNIT IV **12 hours**

Cyber Crimes: Computer misuse - identity theft, grooming and harassment, Hacking, Viruses, criminal damage and mail bombing, Denial of service attack, Obscenity, child abuse, Stalking. Morphing, web jacking, phishing etc., Cyber terrorism, Bandwidth theft, Convention on cybercrime.

Transactional Modes

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

Suggested Readings

- *Senthil, Surya and Devi Lakshmi (2010). Manual of Cyber Laws. New Delhi: Aditya Book Company.*
- *Singh, Ranbir and Singh Ghanshyam (2004). CyberSpace and the Law: Issues and Challenges,Hyderabad: Nalsar University.*
- *Karake-Shalhoub, Z., & Al Qasimi, L. (2010). Cyber law and cyber security in developing and emerging economies. Edward Elgar Publishing.*

Web Sources

- *https://enhelion.com/blogs/2022/09/01/role-of-intellectual-property-in-cyber-law/*
- *https://www.britannica.com/topic/cybercrime*

Course Title: Digital Image Processing
Course Code: BCA615

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Describe the roles of image processing systems in a variety of applications
2. Write programs to read/write and manipulate images: enhancement, segmentation, and compression, spatial filtering.
3. Develop Fourier transform for image processing in frequency domain.
4. Evaluate the methodologies for image segmentation, restoration.

Course Content

Unit I **11 hours**

Introduction: Digital Image Fundamentals: Brightness, Adaptation and Discrimination, Light and Electromagnetic Spectrum, Image Sampling and Quantization, Some Basic Relationships between Pixels Types of images. Spatial Domain Filtering: Some Basic Intensity Transformation Functions, Histogram Equalization,

Unit II **11 hours**

Spatial Correlation and Convolution, Smoothing Spatial Filters: Low pass filters, Order Statistics filters; Sharpening Spatial Filters: Laplacian filter Filtering in Frequency Domain: The Discrete Fourier Transformation (DFT), Frequency Domain Filtering: Ideal and Butterworth Low pass and High pass filters, DCT Transform (1D, 2D).

Unit III **11 hours**

Image Restoration: Image Degradation/Restoration Process, Noise models, Noise Restoration Filters Image Compression: Fundamentals of Image Compression, Huffman Coding, Run Length Coding, JPEG.

Unit IV **12 hours**

Morphological Image Processing: Erosion, Dilation, Opening, Closing, Hit-or-Miss Transformation, Basic Morphological Algorithms. Image Segmentation: Point, Line and Edge Detection, Thresholding, Region Based Segmentation.

Suggested Readings

- *Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins.*
- *Digital Image Processing, 4Th Editionby Rafael C. Gonzalez*
- *An Interdisciplinary Introduction to Image Processing: Pixels, Numbers, and Programs (The MIT Press)by Steven L. Tanimoto*

Web Sources

- *https://www.mygreatlearning.com/blog/digital-image-processing-explained/*
- *https://freecomputerbooks.com/Digital-Image-Processing.html*

Course Title: Introduction to Cloud Computing

Course Code: BCA616

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Gain insight about basic technology behind the Cloud.
2. Comprehend the Cloud computing applications.
3. Learn the models and services of cloud technology.
4. Learn to know the methodologies and technologies for the development of applications that will be deployed and offered through cloud computing environments.

Course Content

UNIT I **12 hours**

Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of clouds, Private Public and hybrid clouds, Cloud Computing architecture, Cloud computing infrastructure, Merits of Cloud computing.

UNIT II **10 hours**

Cloud computing delivery models and services (IaaS, PaaS, SaaS), obstacles for cloud technology, Cloud vulnerabilities, Cloud challenges, Practical applications of cloud computing.

UNIT III **10 hours**

Web-based business services, Delivering Business Processes from the Cloud: Business process examples, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud,

UNIT IV **13 hours**

Assessing the Cloud: software Evaluation, System Testing, Seasonal or peak loading, Cost cutting and cost-benefit analysis, selecting the right scalable application, Considerations for selecting cloud solution.

Transactional modes

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

Suggested Readings

- *Aggarwal, R. S. (2000). A Modern Approach to Verbal & Non Verbal Reasoning. S. Chand.*
- *Carter, P. (2007). IQ and aptitude tests. Kogan Page Publishers.*

Web Sources

- *https://www.tutorialspoint.com/cloud_computing/cloud_computing_introduction.htm*

- *https://www.youtube.com/watch?v=Q9zvgcOrTtw*
- *https://www.forbes.com/sites/forbestechcouncil/2020/06/05/what-is-cloud-computing-a-beginners-guide/?sh=40daa0ed77d7*
- *https://www.ibm.com/cloud/learn/cloud-computing-basics*
- *https://azure.microsoft.com/en-us/overview/what-is-cloud-computing/*

Course Title: Analysis & Design of Algorithms
Course Code: BCA617

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Analyze the performance of algorithms and choose appropriate algorithm design techniques for solving problems.
2. Compare between different data structures. Pick an appropriate data structure for a design situation.
3. Recognize the variations among tractable and intractable problems.
4. Analyze worst-case running times of algorithms using asymptotic analysis.

Course Content

UNIT I **12 hours**

Introduction to Analysis of Algorithm: Algorithm, analysis, Characteristics of an Algorithm, time complexity and space complexity, Well Known Asymptotic Functions & Notations, Big O-notation, Omega notation and theta notation, Sets and disjoint set, union and find algorithms, Heaps. Sorting in linear time.

UNIT II **10 hours**

Divide and Conquer: General Strategy, Exponentiation, Strassen's matrix multiplication. Convex hull, closest pair finding. Divide and conquer binary search, heap sort, and quick sort and merge sort, finding the median.

Greedy Method: General Strategy, Formalization of Greedy Technique, Knapsack problem, Job sequencing with Deadlines, Optimal merge patterns, Minimal Spanning Trees Prim's and Kruskal Algorithm and Dijkstra's algorithm.

UNIT III **10 hours**

Dynamic Programming: General Strategy, The Principle of Optimality, Multistage graphs, OBST, 0/1 Knapsack, Traveling Salesperson Problem, Make change Problem. Flow Shop Scheduling, Chained Matrix Multiplication.

UNIT IV **13 hours**

Backtracking and Branch and Bound: Backtracking: General Strategy, 8 Queens problem, Graph Coloring, Hamiltonian Cycles, 0/1 Knapsack, sum of subset.

Branch and Bound: General Strategy, 0/1 Knapsack, Traveling Salesperson Problem, resource allocation problem.

Transactional modes

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

Suggested Readings

- *Horowitz/ Sahni.Fundamentals of Computer Algorithms, Galgotia Publication. 2006.*
- *Sanjay Dasgupta, Christos Papadimitriou, Umesh Vazirani. Algorithms, Tata Mcgraw Hill, 2006.*
- *Bressard. Fundamentals of Algorithms, PHI.*
- *Thomas H Cormen and Charles E.L Leiserson, Introduction to Algorithms, PHI.*
- *Aho and J.D. Ullman, Design and Analysis of Algorithms, Addison Wesley.*

Web Sources

- *https://vssut.ac.in/lecture_notes/lecture1428551222.pdf*
- *https://mrcet.com/downloads/digital_notes/IT/Design%20and%20Analysis%20Algorithms.pdf*