GURU KASHI UNIVERSITY

Bachelor of Computer Applications
2024-25

Department of Computer Applications

GRADUATE OUTCOME OF THE PROGRAMME

Our university's Bachelor of Computer Applications (BCA) Programme produces graduates with strong computer science principles, proficiency in programming languages and software development techniques, and exceptional problem-solving skills.

PROGRAMME LEARNING OUTCOMES: After completion, the program learner will be able to

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

Program Structure of the Bachelor of Computer Applications

Semester 1st						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credits**
BCA112	Programming using C	Core	4	0	0	4
BCA116	Digital Electronics	Core	4	0	0	4
BCA111	Computer Fundamentals	Core	3	1	0	4
BCA117	Basic Mathematics	Multidisciplinary	3	0	0	3
BCA113	Computer Fundamentals Lab	Technical skill	0	0	4	2
BCA114	Programming using C Lab	Technical skill	0	0	4	2
BCA104	Communication skills	AEC	2	0	0	2
Discipline Elective- I (Any one of the following)						
BCA115	Computer System Architecture	Discipline Elective- I	3	0	0	3
BCA118	Search Engine Optimization					
Total			**19**	**1**	**8**	**24**

Semester 2nd						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BCA202	Programming Using C++	Core	4	0	0	4
BCA211	Operating Systems	Core	4	0	0	4
BCA204	Programming using C++ Lab	Technical skill	0	0	4	2
BCA212	Operating Systems Lab	Technical skill	0	0	4	2
BCA214	Environmental Studies	Compulsory Foundation	2	0	0	2
BCA218	Gender Equality	VAC	2	0	0	2
BCA220	Communication Skills – II	Compulsory Foundation	2	0	0	2
BCA299	XXXX	MOOC	0	0	0	3
Discipline Elective- II (Any one of the following)						
BCA216	E- Commerce	Discipline Elective- II	3	0	0	3
BCA217	Information System Design and Implementation					
Discipline Elective- III (Any one of the following)						
BCA215	Introduction to Human Resource Management	Discipline Elective- III	3	0	0	3
BCA219	Cyber Law					
Total			**20**	**0**	**8**	**27**

Semester 3rd						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BCA312	Data Structures	Core	4	0	0	4
BCA318	Relational Database Management System	Core	4	0	0	4
BCA321	Programming using Python-I	Skill Based	4	0	0	4
BCA322	Data Structures Lab using python	Technical skill	0	0	4	2
BCA319	Relational Database Management System Lab	Technical skill	0	0	4	2
BCA315	Minor Project	Technical skill	0	0	4	2
BCA399	XXXX	MOOC	0	0	0	3
Open Elective Courses (OEC)						
XXXX		OEC	2	0	0	2
Total			**14**	**0**	**12**	**23**
Open Elective Courses (For other Departments)						
OEC013	Digital Marketing	OEC	2	0	0	2

Semester 4th						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BCA409	Programming using Java	Core	4	0	0	4
BCA417	Web Technologies	Core	4	0	0	4
BCA411	Programming using Java Lab	Technical skill	0	0	4	2
BCA418	Web Technologies Lab	Technical skill	0	0	4	2
BCA410	Discrete Mathematics	Multidisciplinary	3	0	0	3
BCA408	Ethical Hacking	VAC	2	0	0	2
Discipline Elective- IV and V (Any one of the following subject with its Lab)						
BCA419	Programming using Python-II	Discipline Elective- IV	3	0	0	3
BCA420	R Programming					
BCA421	Programming using Python-II Lab	Discipline Elective- V	0	0	6	3
BCA422	R Programming Lab					
Total			**16**	**0**	**14**	**23**

Semester 5th						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BCA501	Computer Networks	Core	4	0	0	4
BCA510	Artificial Intelligence	Core	4	0	0	4
BCA511	Artificial Intelligence Lab	Technical skill	0	0	4	2
BCA512	Internship Training* (6 weeks)	Skill Based	-	-	-	6
BCA519	Yoga for Human Excellence	VAC	2	0	0	2
BCA599	XXXX	MOOC	0	0	0	3
Discipline Elective-VI and VII (Any one of the following subject with its Lab)						
BCA515	Programming using PHP	Discipline Elective-VI	3	0	0	3
BCA516	Application Development using ASP.NET					
BCA517	Programming using PHP Lab	Discipline Elective-VII	0	0	6	3
BCA518	Application Development using ASP.NET Lab					
Total			**13**	**0**	**10**	**27**

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

Semester 6th						
Course Code	**Course Title**	**Course Type**				
			L	**T**	**P**	**Credits**
BCA611	Software Engineering	Core	4	0	0	4
BCA618	Computer graphics	Core	4	0	0	4
BCA619	Computer graphics Lab	Technical skill	0	0	4	2
BCA612	Major Project	Technical skill	0	0	6	3
BCA613	Service Learning	Skill Based	0	0	4	2
BCA622	E-Business	Multidisciplinary	3	0	0	3
Disciplinary Elective-VIII (Any one of the following)						
BCA620	Machine Learning	Discipline Elective-VIII	3	0	0	3
BCA621	Internet of Things					
Total			**14**	**0**	**14**	**21**
Grand Total			**96**	**1**	**66**	**145**

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]

Evaluation Criteria for Practical Subjects

Total 20 Marks (Each Practical)

A. Performance of each practical (10 Marks)

B. Report (05 Marks)

C. Practical Viva (05 Marks)

Evaluation Criteria for Training/Internship/Survey Camp etc.

Total 25 Marks

A. Each Report (25 Marks) – Weekly/Monthly (25 Marks)

Evaluation Criteria for other courses has been given separately with the respective courses

SEMESTER I

Course Title: Programming using C
Course Code: BCA112

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

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

Course Content

UNIT I **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 **16 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: Digital Electronics
Course Code: BCA116

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

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

Course Content

UNIT I **15 hours**

Fundamental Concepts: Introduction to Analog and Digital Systems, Digital Signals, Basic Digital Circuits: AND, OR, NOT, NAND, NOR, XOR and XNOR gates. Boolean algebra Theorems, Characteristics of Digital IC.

Number Systems: Positional and Non-positional number systems, Binary, Decimal, Octal and Hexadecimal, Base conversions, Binary arithmetic: Addition and Subtraction, 1"s complement, 2"s complement, subtraction using 1"s complement and 2"s complement.

UNIT II **15 hours**

Combinational Logic Design: SOP and POS Representation of Logic functions, K-Map representation and simplification up to 4 variable expressions, don't care condition.

Multiplexers: 4X1, 8X1 and 16X1. De-multiplexers: 1 to 4, 1 to 8 and 1 to 16. BCD to Decimal decoder, Decimal to BCD encoder. Parity generator and Parity checker. Design of Half adder and Full adder

UNIT III **15 hours**

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

UNIT IV **15 hours**

A/D and D/A Converters: Introduction, Digital to Analog Converters: Weighted-Register D/A converter, R-2R Ladder D/A converter.

Analog to Digital Converters: Quantization and encoding, Parallel-comparator A/D converter, Counting A/D converter.

Transactional Mode

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

Suggested Readings

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

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/*

Course Title: Computer Fundamentals
Course Code: BCA111

L	T	P	Credits
3	1	0	4

Total Hours: 60

Learning Outcomes

After the completion of the 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.

UNIT II **14 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 **16 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: Basic of Mathematics

Course Code: BCA117

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

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

Course Content

UNIT I **10 hours**

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

UNIT II **10 hours**

Set Theory: Introduction, Sets and Elements, Subsets, Venn Diagrams, Set Operations, Algebra of Sets, Duality, Finite Sets, Counting Principle.

UNIT III **14 hours**

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

UNIT IV **11 hours**

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

Transactional Mode

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

Suggested Readings

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

Web Sources

- *https://www.javatpoint.com/discrete-mathematics-tutorial h*
- *https://www.geeksforgeeks.org/discrete-mathematics-tutorial/*
- *https://www.tutorialspoint.com/discrete_mathematics/index.htm*

Course Title: Computer Fundamentals Lab
Course Code: BCA113

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

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

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

Course Content

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 the completion of the course the learner will be able to

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

Course Content

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

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

Course Title: Communication Skills
Course Code: BCA104

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes

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

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

Course Content

UNIT I **8 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 **7 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 **7 hours**

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

UNIT IV **8 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 System Architecture

Course Code: BCA115

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

After the completion of the 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 **12 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 **11 hours**

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

UNIT III **10 hours**

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

UNIT IV **12 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: Search Engine Optimization
Course Code: BCA118

L	T	P	Credits
3	0	0	3

Total Hours 45

Learning Outcomes

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

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

Course Content

UNIT I **13 Hours**

Search Engine Periodic Table, Search Engine Heat Map, and Search Engine on Page SEO factors.

Internet Business Promoter (IBP) SEO software installation.

Testing Pages for ON PAGE SEO factors using SEO analysis tools i.e. IBP SEO software. Traffic Travis SEO Analysis, On-Page Factors, Originality & Fresh Content, Writing for Humans, SEO Analysis, Images Optimization.

Types of Google Ads campaigns. Understanding various types of Google Ads campaigns, Ads Account Limits.

UNIT II **11 Hours**

IP Address Exclusion, Guideline of Google ads, what is CTR, Impression, CPC.

The elements of a search ad, Targeting options, bidding and ranking for search ads, Tracking, Use the Google Ads Editor to Manage Your Ads and Keywords.

UNIT III **11 Hours**

Introduction, what is pay –per click? Key terms and concepts, advertising in search, difference between search and display campaign, recent update in ads, account structure in ads

The Benefits of PPC in the Purchase Phase Set Up the Search and Content Networks, Keyword Research, Trademarks and Keywords.

UNIT IV **10 Hours**

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

Transaction Mode

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

Suggested Readings

- Das, S. (2021). *Search engine optimization and marketing: A recipe for success in digital marketing*. CRC press.
- Zilincan, J. (2015, September). Search engine optimization. In *CBU International Conference Proceedings* (Vol. 3, pp. 506-510).
- Shahzad, A., Jacob, D. W., Nawi, N. M., Mahdin, H., &Saputri, M. E. (2020). *The new trend for search engine optimization, tools and techniques*. *Indonesian Journal of Electrical Engineering and Computer Science*, *18*(3), 1568-1583.

Web Sources

- https://www.youtube.com/watch?v=zvy6oV67qdM
- https://www.youtube.com/watch?v=egOUkS26a64
- https://www.youtube.com/watch?v=mPLErgPWzpE

SEMESTER II

Course Title: Programming using C++
Course Code: BCA202

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

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

Course Content

UNIT I **15 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 **15 hours**

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

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

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

UNIT III **15 hours**

Extending Classes using Inheritance: Introduction, base class, derived class, defining derived classes, visibility modes: private, public,

protected; single inheritance: privately derived, publicly derived; making a protected member inheritable, access control to private and protected members by member functions of a derived class, multilevel inheritance, virtual base classes, abstract classes, nesting of classes.
Pointers, Virtual Functions and polymorphism: virtual and pure virtual functions, function overloading, operator overloading.

UNIT IV **15 hours**

Console I/O Operations: C++ Stream Classes, Unformatted I/O functions-put(), get(), getline(), write(), Formatting with ios class functions and flags, Manipulators.
Files and Streams: Text and binary streams, The stream class hierarchy, Processing files, declaring files, opening files using open() function or constructor function, closing files, String I/O, Sequential and random Access, File updation.

Transactional Mode

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

Suggested Readings

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

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 Systems

Course Code: BCA211

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

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

Course Content

UNIT I **16 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 **14 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++ Lab
Course Code: BCA204

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

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

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

Course Title: Operating System Lab
Course Code: BCA212

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

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

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

Course Content

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

Course Title: Environmental Studies
Course Code: BCA214

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes

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

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

Course Content

UNIT I **8 hours**

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

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

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

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

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

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

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

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

UNIT II **7 hours**

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

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

UNIT III **7 hours**

Environmental Pollution Definition: Causes, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution e. Noise

pollution f. Thermal pollution g. Nuclear hazards, ill-effects of fireworks, Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV **8 hours**

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

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

Transactional Mode

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

Suggested Readings

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

Web Sources

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

Course Title: Gender Equality

Course Code: BCA218

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes

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

1. Discuss the concept of gender equality and application under Indian laws.
2. Explain the constitutional safeguards and UCR related to gender equality in India.
3. Define the issues related to gender justice in India.
4. Examine the gender related crimes like child marriage, prostitution and trafficking.
5. Describe the various Gender Justice Issues- work, health and education.

Course Content

UNIT-I **8 Hours**

The Concept of Gender - the Biological Distinction, Constitutional Safeguards, Convention on Elimination of All Forms of Discrimination against Women, Protection of Women from Violence

UNIT-II **7 Hours**

Gender Justice and Personal Laws, Adoption and Guardianship Rights, Property and Inheritance Rights, Rights of Maintenance, Uniform Civil Code towards Gender Justice

UNIT-III **8 Hours**

Gender Related Crimes, Child Marriage, Prostitution and Trafficking, Female Feticide, Sexual Harassment of Women

UNIT- IV **7 Hours**

Gender Justice Issues, Women and Work, Women and Health, Women and Education

Transactional Mode

Video based Teaching, Collaborative Teaching, Cooperative, Teaching; power point presentation.

Suggested Readings

- Tripathi S.C. (2008) “Law Relating to Women and Children”, Central Law Publication, Allahabad.
- Chakrabarti, N. K (2007) “Gender Justice”, R. Cambray and Company, Kolkata

- Jain, M.P,(2008) “Constitution of India”, Wadhwa and Company, New Delhi

Web Sources:

- *UN Women Training Centre eLearning Campus. Website: portal.trainingcentre.unwomen.org*
- *UNESCO Gender Equality Tools. Website: unesco.org/en/gender-equality*
- *Virtual Gender in Humanitarian Action Course by UN Women. Website: portal.trainingcentre.unwomen.org*

Course Title: Communication Skills - I
Course Code: BCA220

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes

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

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

Course Content

UNIT I **8 hours**

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

UNIT II **7 hours**

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

UNIT III **7 hours**

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.

UNIT IV **8 hours**

Business Communication: Quotation, Place of order, Complaints and adjustments.

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: E-Commerce
Course Code: BCA216

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

After the completion of the 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-governmentcommerce-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

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

1. Understand the various aspects of Information Systems analysis and design.
2. Identify prerequisites for software development and comprehend associated paradigms.
3. Apply analytical and design principles to create effective information systems.
4. Analyze and document user requirements for information systems.

Course Content

UNIT I **12 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 **11 hours**

System Planning and the Initial Investigation: Bases for planning in system analysis, Initial investigation, determining the users 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 tools.

UNIT III **11 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. ,SiauKeng, Chiang Roger H.L., *Systems Analysis and Design : Techniques, Methodologies, Approaches and Architecture*s 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/wpcontent/uploads/sites/22/2020/04/file_5e95e008f2daf.pdf

Course Title: Introduction to Human Resource Management

Course Code: BCA215

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

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

Course Content

UNIT I **12 hours**

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

UNIT II **12 hours**

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

UNIT III **11 hours**

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

UNIT IV **10 hours**

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

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

Suggested 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: Cyber Law

Course Code: BCA219

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

After the completion of the 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: Cyber Space-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-intellectualproperty-in-cyber-law/
- https://www.britannica.com/topic/cybercrime

SEMESTER III

Course Title: Data Structures
Course Code: BCA312

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

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

Course Content

UNIT I **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: Relational Database Management System

Course Code: BCA318

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Identify the difference about database systems from the file systems by enumerating their features.
2. Acknowledge the role of the database administrator.
3. Retain the knowledge about physical and logical database designs.
4. Converts an Entity-Relationship diagram to Relational Schema.

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,

Joins: Inner join,leftjoin,Rightjoin,Full join, 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: Programming using Python-I
Course Code: BCA321

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

After the completion of the 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: Data Structures using python Lab

Course Code: BCA314

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

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

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

Course Content

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

Course Title: Relational Database Management Systems Lab

Course Code: BCA319

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

After the completion of the 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: Minor Project
Course Code: BCA315

L	T	P	Credits
0	0	4	2

Total Hours: 60

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: 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/digitalmarketing/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 the completion of the 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, Labeled 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: Web Technologies
Course Code: BCA417

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Analyze a web page and identify its elements and attributes.
2. Create web pages using XHTML and Cascading Style Sheets.
3. Build dynamic web pages using JavaScript and PHP.
4. Develop websites with latest technologies.

Course Content

UNIT I **14 hours**

Introduction to websites, Static vs dynamic websites, server side and client side scripting, HTML 5 : Introduction , Structure of a web page, HTML Elements, HTML attributes, Basic Text Formatting tags, Comments, Links, Lists, Image, Style, Forms, Table, Media, Classes, iframes.

CSS3 : Introduction , style sheets , selectors , styling – backgrounds, texts , fonts , links ,lists, tables , Box model JAVASCRIPT: Introduction, data types, variables, comments ,Operators, functions and events, basics of JQuery and AJAX

UNIT II **16 hours**

Introduction to PHP, basics, Data types, variables, comments, control statements, functions, PHP with web design, working with files, uploading a file, sessions, cookies, error handling , database connectivity with mysql.

UNIT III **14 hours**

HOSTING : Overview of Domain , Hosting , SSL Certificates and steps to host a website online, Introduction to Emerging Web Technologies: Introduction to Chabot, Artificial Intelligence and Machine Learning basics used in websites.

UNIT IV **16 hours**

EMERGING WEB TECHNOLOGIES: Basics of Internet Of Things (IOT) used in Websites, Basics of Block Chain Technology in Websites, Augmented Reality and Virtual Reality and Basics of Single page applications websites using Angular.

Transactional Mode

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

Suggested Readings

- *Chris Bates, "Web Programming- Building Internet Applications", Wiley India, 2006.*
- *David William Baron, The World of Scripting Languages.*
- *Programming PHP Rasmus Leadoff and Levin Tatroe O"' Reilly Publication.*
- *Steven HolznerPhp: The Complete Reference 1st Edition McGraw Hill Publication.*
- *Achyut S Godbole and AtulKahate, "Web Technologies", Tata McGraw Hill.*

Web Sources

- *https://www.vignan.ac.in/subjectspg/MC117.pdf*
- *https://www.geeksforgeeks.org/web-technology/*
- *https://developer.mozilla.org/en-US/docs/Web*

Course Title: Programming using Java Lab
Course Code: BCA411

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

After the completion of the 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: Web Technologies Lab
Course Code: BCA418

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

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

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

Course Contents

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

Course Title: Discrete Mathematics
Course Code: BCA410

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Implement the Logical and Algebraic operations.
2. Demonstrate the basic principles of relation in a set.
3. Solve the various methods of Recurrence relations.
4. Perform operations on sets, functions, relations, and sequences.

Course Content

UNIT I **12 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 **11 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 **10 hours**

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

UNIT IV **12 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: Ethical Hacking
Course Code: BCA408

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes

After the completion of the 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 **7 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 **8 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 **7 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 **8 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: Programming using Python-II
Course Code: BCA419

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Understand the variables, expressions and statements.
2. Apply conditional and looping constructs.
3. Design and import functions in python programming.
4. Learn Graphical User Interface using python.

Course Content

Unit I **12 Hours**

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

Unit II **10 Hours**

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

Unit III **11 Hours**

Introduction to Matplotlib: Overview of data visualization and importance of Matplotlib.

Basics of Matplotlib: pyplot interface, creating line plots, scatter plots.

Customizing plots: labels, colors, markers

Plotting categorical data: bar plots, pie charts.

Plotting quantitative data: histograms, box plots.

Unit IV **12 Hours**

Overview of SQL: Structured Query Language for managing relational databases.

Basic SQL commands: CREATE TABLE, INSERT INTO, SELECT, UPDATE, DELETE.Establishing database connection with python, creating databases and tables. Performing basic CRUD operations: inserting, querying, updating, and deleting data.

Transactional Mode

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

Suggested Readings

- *Python Crash Course" by Eric Matthes*

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

Web Sources

- https://www.w3schools.com/python/
- https://docs.python.org/3/tutorial/index.html

Course Title: Programming using R
Course Code: BCA420

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Import/export small data sets in and out of R environment.
2. Draw different types of plots to aid analysis of datasets.
3. Interpret and use the results of analysis.
4. Analyze the Data visualization techniques.

Course Content

Unit I **12 hours**

Introduction to R: installation of R, features of R, applications of R programming, data types in R, scripting in R, data editing, use of R as a calculator, control structures in R. R Programming Structures, Control Statements, Loops

Unit II **11 hours**

Data Handling in R: importing data in R (loading Tables and CSV files), Reading and writing files in R

Unit III **10 hours**

Basic data structures in R: Vectors, matrices, array, lists, data frames.

Unit IV **12 hours**

Visualization Tools: Introduction to simple graphics and plots, bar charts, histograms, pie charts, scatter plots (plotting multiple variables), line plots and regression, word clouds, radar charts, waffle charts, box plots, exporting plots as images.

Suggested Reading

● *Wickham, H. (2016). ggplot2 Elegant Graphics for Data Analysis. Springer.*

● *Hadley Wickham's book "ggplot2: Elegant graphics for data analysis,"*

Web Sourses

● *https://www.javatpoint.com/r-data-visualization*

● *https://www.geeksforgeeks.org/data-visualization-in-r/*

●*https://intellipaat.com/blog/tutorial/rprogramming/datavisualization-in-r/*

Course Title: Programming using Python-II Lab

Course Code: BCA516

L	T	P	Credits
0	0	6	3

Total hours 90

Learning Outcomes

After the completion of the 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

1. Program to demonstrate the usage of input function.
2. Program to implement decision controls
3. Program to implement different looping statements.
4. Program to show the usage of different libraries.
5. Program to implement the usage of Numpy.
6. Program to make a 3x3 matrix and perform possible operations.
7. Program to show the usage of modules.
8. Program to show the usage of Matplotlib library.
9. Program to implement all possible data visualization techniques.
10. Program to create a database and make a connection with it.
11. Program to perform CRUD operations.

Course Title: R Programming Lab

Course Code: BCA517

L	T	P	Credits
0	0	6	3

Total Hours 90

Learning Outcomes

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

1. Understand the basics of R programming language and its syntax.
2. Acquire skills in importing data from various file formats into R.
3. Create advanced plots including histograms, box plots, and violin plots.
4. Perform hypothesis testing using t-tests and chi-square tests.

Course Content

1. Installation of R and RStudio.
2. Program to show the concept of data Import and Export.
3. Program to implement data Manipulation with dplyr.
4. Program to create basic plots: scatter plots, line plots, bar plots.
5. Program to create advanced plots: histograms, box plots, violin plots.
6. Program to implement mean, median, standard deviation.
7. Program to show the usage of Regression Analysis.
8. Program to convert data between wide and long formats.
9. Program to Exporting reports to PDF, and other formats.

SEMESTER V

Course Title: Computer Networks
Course Code: BCA501

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

After the completion of the 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
Course Code: BCA510

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Identify problems that are amenable to solution by specific AI methods
2. Represent knowledge in Prolog and write code for drawing inferences.
3. Identify appropriate AI technique for the problem at hand
4. Compare strengths and weaknesses of different artificial Intelligence techniques.

Course Content

UNIT I **15 hours**

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

UNIT II **15 hours**

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

UNIT III **15 hours**

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

Ethics in AI, Fairness in AI, Legal perspective

UNIT IV **15 hours**

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

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

Transactional modes

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

Suggested Readings

- *Winston, P. H. (1992). Artificial intelligence. Addison-Wesley Longman Publishing Co., Inc..Winston, P. H. (1984). Artificial intelligence. Addison-Wesley Longman Publishing Co., Inc..*
- *Boden, M. A. (Ed.). (1996). Artificial intelligence. Elsevier.*
- *Hunt, E. B. (2014). Artificial intelligence. Academic Press.*

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: Artificial Intelligence Lab
Course Code: BCA511

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

After the completion of the 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
0	0	0	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: Yoga for Human Excellence

Course Code: BCA519

Total Hours: 30

L	T	P	Credits
2	0	0	2

Unit I: Introduction to Yoga Philosophy

a) Understanding the origins and philosophy of yoga.
b) Exploring the eight limbs of yoga (Ashtanga Yoga) according to Patanjali's Yoga Sutras.
c) Introduction to Hatha Yoga and its principles.
d) The holistic approach of yoga towards physical, mental, and spiritual well-being.
e) Practical session: Basic yoga postures (asanas) and breathing techniques (pranayama).

Unit II: Physical Aspects of Yoga Practice

a) Exploring the anatomy and physiology of yoga postures.
b) Understanding alignment principles for safe and effective practice.
c) Developing strength, flexibility, and balance through asana practice.
d) Yoga for stress relief and relaxation: practicing restorative and gentle yoga sequences.
e) Practical session: Sun Salutations (Surya Namaskar) and variations.

Unit III: Mental and Emotional Well-being

a) The role of yoga in promoting mental health and emotional balance.
b) Techniques for mindfulness and meditation in yoga practice.
c) Yoga psychology: understanding and managing emotions.
d) Cultivating positive thinking and resilience through yoga.
e) Practical session: Guided meditation and relaxation techniques.

Unit IV: Yoga for Spiritual Growth and Self-Realization

a) Exploring the deeper dimensions of yoga beyond physical practice.
b) The concept of self-awareness (AtmaBodha) and self-realization (AtmaJnana).
c) Integrating yoga philosophy into daily life: living with mindfulness and compassion.
d) Understanding the interconnectedness of all beings (Yoga Vasishtha).
e) Practical session: Yoga Nidra for deep relaxation and inner exploration.

Textbooks:

1. "The Heart of Yoga: Developing a Personal Practice" by T.K.V. Desikachar
2. "Light on Yoga" by B.K.S. Iyengar
3. "The Yoga Sutras of Patanjali" by Sri Swami Satchidananda
"The Key Muscles of Yoga" by Ray Long

Course Title: Programming using PHP

Course Code: BCA515

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

After the completion of the 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 associatively.

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 ASP.NET
Course Code: BCA516

L	T	P	Credits
3	0	0	3

Total Hours 45

Learning Outcomes

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

1. Enable the students to develop applications using event driven programming with VB.net
2. Design (as front end) and accessing database at back end.
3. Develop a form-based or window-based application.
4. Build an attractive user interface.

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: Text Box, 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 C#: 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.

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 usning Visual Basic.Net, Cambridge University Press.*
- *Cameron Wakefield Henk-Evert Sonder Wei Meng Lee, VB.NET Developer's Guide, Global Knowledge, Syngress Publishing.*
- *EvangelosPetroutsos, 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.html
- https://www.geeksforgeeks.org/introduction-to-net-framework/

Course Title: Programming using PHP Lab

Course Code: BCA517

L	T	P	Credits
0	0	6	3

Total Hours 90

Learning Outcomes

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

1. Develop dynamic web applications using PHP.
2. Demonstrate proficiency in implementing security.
3. Employ PHP to interact with databases and manipulate data.
4. Apply best practices in PHP programming and Unix system administration to ensure robust and reliable web applications."

Course Content

1. Write a PHP program to check whether given number is palindrome or not.
2. Write a PHP program to check whether given number is Armstrong or not.
3. Write a Mathematical calculator program.
4. Write a Age calculator program.
5. Write a PHP program to check whether given number is String palindrome or not.
6. Write a PHP program using function.
7. Create a PHP page for login page without sql connection.
8. Write a PHP program to Array manipulation.
9. Write a PHP program to design personal information
10. Create a PHP page for login page with sql connection.
11. Write a PHP program to Read from existing file.
12. Write a PHP program to Write a file
13. Write a PHP program to calculate Date and Time function .
14. Write a PHP program to design Curriculum Vitae.
15. Write a PHP program hit counter using cookies

Course Title: Application Development using ASP.NET Lab

Course Code:BCA518

L	T	P	Credits
0	0	6	3

Total Hours 90

Learning Outcomes

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

1. Write, compile and debug programs in C# language.
2. Learn the basics of object oriented programming.
3. Get knowledge of windows programming.
4. Gain knowledge on web services and dynamic link libraries.

Course Content

1. Write a C# program to find the greatest among three numbers.
2. Write a C# program for addition and multiplication of two matrices.
3. Write a C# programs to demonstrate the concepts of Constructors and Inheritance.
4. Write a C# programs to demonstrate the concepts of Polymorphism
5. Write a C# programs to demonstrate the concepts of Label, Text Box and Button controls.
6. Write a C# programs to demonstrate the concepts of Combo Box and List Box controls.
7. Create a Windows application in C# for registration form and fill the details and when you click the submit button it display the details in the message box.
8. Create a Windows application in C# having two text boxes and three buttons named as factorial, prime, factorial series. When you click any button the resultant value will be displayed on the second textbox.
9. Design an ASP.NET Webpage to demonstrate the Label, Button and Textbox controls.
10. Design an ASP.NET Webpage to work with Dropdown list and ListBox controls.
11. Develop a Registration Form with all Validation Controls.

SEMESTER VI

Course Title: Software Engineering
Course Code: BCA611

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

After the completion of the 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: Computer Graphics
Course Code: BCA618

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

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

Course Content

UNIT I **15 hours**

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

Overview of Graphics Systems: Video Display Devices, Cathode Ray Tube, CRT monitors, Flat panel displays: Plasma Panel display, Thin-film electroluminescent displays, LED, Liquid Crystal Displays (LCD), Raster Scan Systems, Random Scan Systems.

UNIT II **15 hours**

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

UNIT III **15 hours**

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

UNIT IV **15 hours**

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

Transactional modes

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

Suggested Readings

- *Hearn, D., Baker, M. P., & Baker, M. P. (2004). Computer graphics with OpenGL (Vol. 3). Upper Saddle River, NJ:: Pearson Prentice Hall.*

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

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: Computer Graphics Lab

Course Code: BCA619

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

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

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

Course Content

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

Mini Project:-Moving Car

Course Title: Major Project
Course Code: BCA612

L	T	P	Credits
0	0	6	3

Total Hours: 90

Learning Outcomes

After the completion of the 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 30

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

Suggested 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: E-Business

Course Code: BCA622

L	T	P	Credits
3	0	0	3

Total Hours 45

Learning Outcomes

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

1. Understand the use of Computers in decision making
2. Aware of the ethical, social and security issues of information systems.
3. The objective is to expose the students to electronic modes of commercial operations.
4. Analyzing records according to management policy.

Course Content

UNIT 1 **12 Hours**

Introduction, E-Commerce – definition, History of E-commerce, types of E-Commerce B to B etc. Comparison of traditional commerce and e-commerce. E-Commerce business models – major B to B, B to C model, Consumer-to-Consumer (C2C), Consumer-to-Business (C2B) model, Peer to-Peer (P2P) model – emerging trends. Advantages/ Disadvantages of ecommerce, web auctions, virtual communities, portals, e-business revenue models.

UNIT 2 **11 Hours**

Security threats – An area view – implementing E-commerce security – encryption – Decryption, Protecting client computers E-Commerce Communication channels and web servers Encryption, SSL protocol, Firewalls, Cryptography methods, VPNs, protecting, networks, policies and procedures.

UNIT 3 **11 Hours**

E-payment systems – An overview. B to C payments, B to B payments. Types of E- payment system – Credit card payment, debit cards, accumulating balance, online stored value payment systems, digital cash, digital (electronic) wallets, agile wallet, smart cards and digital cheques. Secure Electronic Transaction (SET) protocol. RFID Concepts.

UNIT 4 **11 Hours**

E-Commerce and marketing B to B and B to C marketing and branding strategies. Web transaction logs, cookies, shopping cart database, DBMS, SQL, data mining, CRM (customer relationship Management) system – permission marketing, affiliate marketing, viral marketing.

Transactional Modes

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

Suggested Readings

- *Kalakota Ravi and A. B. Whinston : "Frontiers of Electronic Commerce", Addison*
- *Watson R T :"Electronic Commerce – the strategic perspective." The Dryden press*
- *Agarwala K.N and DeekshaArarwala: "Business on the Net – Whats and Hows of ECommerce"*
- *Agarwala and Ararwala : "Business on the Net – Bridge to the online store front,"*
- *Murthy CSV: "E. Commerce" Himalaya Publishing House Pvt.Ltd.*

Web Sources

- https://www.gartner.com/en/information-technology/glossary/e-business#:~:text=E%2DBusiness%20(electronic%20business),or%20management%2Dfocused%20business%20processes.
- https://study.com/academy/lesson/e-businesses-types-examples.html

Course Title: Machine Learning
Course Code: BCA620

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Describe the basic concepts of Bayesian Decision Theory.
2. Implement the working of perceptron learning algorithm, criterion and Windrow-Hoff learning algorithm.
3. Depict the algorithms like Nearest Neighbor classification, K-nearest neighbor and their applications.
4. Evaluate the models generated from data.

Course Content

UNIT I **11 Hours**

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

UNIT II **11 Hours**

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

UNIT III **11 Hours**

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

UNIT IV **12 Hours**

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

Trade Offs.

Transactional Modes

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

Collaborative Learning**.**

Suggested Readings

● *Alpaydin, E. (2020). Introduction to machine learning. MIT press.*

● *Jordan, M. I., & Mitchell, T. M. (2015). Machine learning: Trends, perspectives, and prospects. Science, 349(6245), 255-260.*

● *Mitchell, T. M., & Mitchell, T. M. (1997). Machine learning (Vol. 1, No. 9). New York: McGraw-hill.*

● *Bishop, C. M., & Nasrabadi, N. M. (2006). Pattern recognition and machine learning (Vol. 4, No. 4, p. 738). New York: Springer.*

Web Sources

●*https://www.javatpoint.com/machine-learning-decision-treeclassification-algorithm*

●*https://data-flair.training/blogs/advantages-and-disadvantages-ofmachine-learning/*

● *https://www.w3schools.com/ai/ai_perceptrons.asp*

Course Title: Internet of Things
Course Code: BCA621

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Understand the various concepts, terminologies and architecture of IoT systems.
2. Use sensors and actuators for design of IoT.
3. Understand and apply various protocols for design of IoT systems
4. Use various techniques of data storage and analytics in IoT

Course Content

UNIT I **11 hours**

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

UNIT II **12 hours**

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

UNIT III **12 hours**

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

UNIT IV **10 hours**

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

Suggested Reading:

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

- *J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.*
- *Keysight Technologies, "The Internet of Things: Enabling Technologies and Solutions for Design and Test", Application Note, 2016***.**

Web Sourses:

- *Daniel Minoli, — "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications*
- *Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press*
- *https://onlinecourses.nptel.ac.in/noc17_cs22/course*
- *http://www.cse.wustl.edu/~jain/cse57015/ftp/iot_prot/index.htmlges*