GURU KASHI UNIVERSITY

Bachelor of Science (Information Technology)
2024-25
Department of Computer Applications

GRADUATE OUTCOME OF THE PROGRAMME

The B.Sc. (IT) program equips graduates with strong technical skills and transferable abilities, enabling them to excel in diverse IT roles and drive organizational digital transformation.

PROGRAMME LEARNING OUTCOMES:

After completing the programme, the learner will be able to:

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

Programme Structure for Bachelor of Science (Information Technology)

Semester I						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credit**
BIT112	Programming Using C	Core	3	1	0	4
BIT117	System Analysis and Design	Core	4	0	0	4
BIT111	Computer Fundamentals & Computing Software	Compulsory Foundation	2	0	0	2
BIT118	Digital Electronics	Multi-disciplinary	3	0	0	3
BIT113	Computer Fundamentals & Computing Software Lab	Technical skill	0	0	4	2
BIT114	Programming using C Lab	Technical skill	0	0	4	2
BIT104	Communication skills	AEC	2	0	0	2
BIT119	Communication skills lab	Skill Based	0	0	2	1
Total			**14**	**1**	**10**	**20**

Semester II						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credit**
BIT211	Operating Systems	Core	4	0	0	4
BIT202	Programming Using C++	Core	4	0	0	4
BIT216	Computer System Architecture	Skill Based	3	1	0	4
BIT212	Operating Systems Lab	Technical skill	0	0	4	2
BIT205	Programming Using C++ Lab	Technical skill	0	0	4	2
BIT214	Environmental Studies	Compulsory Foundation	2	0	0	2
BIT218	Gender Equality	Value Added Course	2	0	0	2
BIT299	XXXX	MOOC	0	0	0	2
Total			15	1	8	22

Semester III						
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**Credit**
BIT310	Introduction to Python	Core	4	0	0	4
BIT317	Relational Database Management Systems	Core	3	1	0	4
BIT312	Introduction to Python Lab	Technical skill	0	0	4	2
BIT319	Relational Database Management Systems Lab	Technical skill	0	0	4	2
BIT399	XXXX	MOOC	0	0	0	2
Discipline Elective- I (Any one of the following)						
BIT315	Application Development using VB.NET	Discipline Elective- I	3	0	0	3
BIT316	Programming Using PHP					
Discipline Elective- II (Any one of the following)						
BIT320	Artificial Intelligence	Discipline Elective- II	3	0	0	3
BIT321	Parallel Processing					
Open Elective Course						
XXXX		OEC	2	0	0	2
Total			**15**	**1**	**8**	**22**
Open Elective Courses (For other Departments)						
OEC013	Digital Marketing	OEC	2	0	0	2

Semester IV						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credit**
BIT409	Data Structure	Core	4	0	0	4
BIT419	Data Communication	Core	4	0	0	4
BIT412	Data Structure Lab	Technical skill	0	0	4	2
BIT413	Minor Project	Technical skill	0	0	4	2
BIT408	Ethical Hacking	VAC	2	0	0	2
BIT419	Basic of Statistical Methods	Multi-Disciplinary	2	0	0	2
Discipline Elective- III (Any one of the following)						
BIT414	Theory of Computation	Discipline Elective- III	3	0	0	3
BIT418	Deep Learning					
Discipline Elective- IV (Any one of the following)						
BIT416	Big Data	Discipline Elective-IV	3	0	0	3
BIT417	Digital Image Processing					
Total			**18**	**0**	**8**	**22**

Semester V						
Course Code	**Course Title**	**Course Type**				
			L	**T**	**P**	**Credit**
BIT509	Programming Using Java	Core	4	0	0	4
BIT502	Computer Networks	Core	4	0	0	4
BIT510	Programming Using Java Lab	Technical skill	0	0	4	2
BIT513	Computer Networks Lab	Technical skill	0	0	4	2
BIT511	Internship Training* 6 Weeks	Internship	-	-	-	6
BIT519	Yoga for Human Excellence	VAC	2	0	0	2
BIT599	XXXX	MOOC	0	0	0	2
Discipline Elective-V (Any one of the following)						
BIT508	Data Warehouse and Data Mining	Discipline Elective-V	3	0	0	3
BIT512	Machine Learning					
Total			**13**	**0**	**8**	**25**
Note: *After the fourth semester during summer vacation for 6 weeks.						

Semester VI						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credit**
BIT601	Computer Graphics	Core	4	0	0	4
BIT610	Software Engineering	Core	4	0	0	4
BIT603	Computer Graphics Lab	Technical Skill	0	0	4	2
BIT611	Major Project	Technical skill	0	0	8	4
BIT612	Service Learning	Skill Based	0	0	4	2
BCA617	E-Business	Multidisciplinary	3	0	0	3
Discipline Elective-VI (Any one of the following)						
BIT613	Internet of Things	Discipline Elective –VI	3	0	0	3
BIT614	Introduction to Cloud Computing					
Discipline Elective-VII (Any one of the following)						
BIT615	Data Visualization Using R	Discipline Elective- VII	3	0	0	3
BIT616	Neural Networks					
Total			**17**	**0**	**16**	**22**
Grand Total			**92**	**3**	**58**	**136**

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 (5Marks)
B. Attendance (5 marks)
C. Mid Semester Test: [30 Marks]
D. End-Term Exam: [40 Marks]

SEMESTER I

Course Title: Programming Using C

Course Code: BIT112

L	T	P	Credits
3	1	0	4

Total Hours: 60

Learning Outcomes

1. After completion of this course, the learner will be able to:
2. Develop confidence for self-education and ability for life-long learning needed for Computer language.
3. Examine errors handling during program execution.
4. Compare the Union and Structure concept in Programming.
5. 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 argument.

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); args and arg; File opening modes: Text mode, Binary mode.

Suggested Reading:

- *Kanetkar, Y. (2018). Let us C. BPB publications.*
- *Hanly, J. R., & Koffman, E. B. (2007). Problem solving and program design in C. Pearson Education India.*
- *Salaria, R.S. Test Your Skills in C, Salaria Publications, New Delhi.*
- *Byron S. Gottfried, Programming in C, McGraw Hills Publishers, New York.*

Web Sources

- *https://hamrocsit.com/note/c-program/problem-solving-computer/*
- *https://learnprogramo.com/problem-solving-through-programming-in-c-1/*

Course Title: System Analysis And Design
Course Code: BIT117

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Understand the fundamental concepts of system analysis and design.
2. Learn the various methodologies and models used in system development.
3. Develop skills in requirements gathering and documentation.
4. Gain proficiency in system modeling and design using UML and other tools.

UNIT I **15 hours**

Introduction: System definition and concepts: Characteristics and types of system, Manual and automated systems. Systems models types of models: Systems environment and boundaries, Real-time and distributed systems, Basic principles of successful systems.

UNIT II **15 hours**

Systems analyst: Role and need of systems analyst, Qualifications and responsibilities, Systems Analyst as an agent of change, Systems analysis: Initial investigation, needs identification, determining the user's information requirements, Information-gathering tools.

UNIT III **15 hours**

Structured analysis tools: Data flow diagram, Data dictionary, Decision tree, Structured English, Decision tables. Feasibility study: Feasibility considerations, Steps in Feasibility analysis. Systems Design: The process and stages of systems design, Input/output and forms design, Database design.

UNIT IV **15 hours**

Object Oriented Analysis and design: Introduction to Object Oriented Analysis and design life cycle, object modeling: Class Diagrams, Dynamic modeling: state diagram, Dynamic modeling: sequence diagramming.

Suggested Readings:

- *E. M. Awad: Systems Analysis and Design, Galgotia Publications (P) Ltd.*
- *Whitten, Bentaly and Barlow:System Analysis and Design Methods, Galgotia Publication.*
- *Jeffrey A. Hofer Joey F. George Joseph S. Valacich Addison Weseley Modern System Analysis and Design.*

Web Sources

- www.javatpoint.com/computer-fundamentals-tutorial
- *https://www.g*
- *eeksforgeeks.org/system-design-tutorial/*

Course Title: Computer Fundamentals and Computing Software
Course Code: BIT111

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. Classify binary, hexadecimal and octal number system and their arithmetic operations.

Analyze the concept of computer devices and recognition of the basic terms used in computer programming.

2. Identify and learn the details of the components of a personal computer system.
3. Demonstrate the functions of computer programming languages.

Course Content

UNIT I **6 hours**

Computer Appreciation: Introduction to computers, characteristics of computer; History of computers; Classification of computers on size: (Micro, Mini, Mainframe and supercomputers), Working Principles, Generations; Applications of computers; commonly used terms– Hardware, Software, Firmware.

Basic Computer Organization: Block diagram of computer system, input unit, Processing Unit and Output Unit; Description of Computer input devices: Keyboard, Mouse, Trackball, Pen, Touch screens, Scanner, Digital Camera; Output devices: Monitors, Printers, Plotters.

UNIT II **6 hours**

Computer Memory: Representation of information: BIT, BYTE, Memory, Memory size; Units of measurement of storage; Main memory: Storage evaluation criteria, main memory organization, RAM, ROM, PROM, EPROM; Secondary storage devices: Sequential Access Memory, Direct Access Memory Magnetic Tapes, Magnetic disks, Optical disks: CD, DVD; Memory storage devices: Flash Drive, Memory card; Types of software: System and Application software; Programming Languages: Generation of Languages; Translators Interpreters, Compilers, Assemblers and their comparison.

UNIT III **9 hours**

Word Processing Package: Opening, saving and closing an existing document; renaming and deleting files; Using styles and templates: Introduction to templates and styles; applying, modifying and creating new (custom) styles; using a template to create a document, creating a template, editing a template, organizing templates, examples of style use, Changing document views, Moving quickly through a document, Working with text: select, cut, copy, paste, find and replace, inserting. special characters, setting tab stops and indents, Checking spelling and Grammar, Autocorrect, Using built-in language tools, word completion, Auto text.

Formatting text: Using Styles, formatting paragraphs, formatting characters, auto-formatting, creating lists.

Formatting pages: Using layout methods, creating headers and footers, Numbering pages, changing page margins, adding comments to a document, creating a table of contents, creating indexes and bibliographies, printing a document, using mail merge, Tracking changes to a document, using fields, linking to another part of a document, using master documents, Creating fill-in forms.

UNIT IV **9 hours**

Spreadsheet Package: Introduction to Spreadsheets, sheets and cells; Opening and saving spreadsheet files.

Working with sheets: inserting new sheet, deleting and renaming sheets, Viewing a spreadsheet: freezing rows and columns, splitting screen Entering data: cell referencing, formatting cells, entering numbers, entering numbers as text, entering formulae, entering date and time, deactivating automatic changes. Speeding up data entry: using fill tool, fill series, defining fill series, Validating cell contents, formatting data: formatting text, numbers, cells, Auto formatting cells and sheets, defining new auto format, using conditional formatting, Hiding and showing data, Sorting records, printing a spreadsheet document: using print ranges, page formats, inserting page breaks, headers and footers;

Working with Graphs and Charts: Creating Embedded Chart, formatting chart: Changing chart types, adding Titles, Legends and Gridlines, Printing Charts.

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://www.javatpoint.com/computer-fundamentals-tutorial*
- *https://testbook.com/computer-awareness/computer-fundamentals*

Course Title: Digital Electronics
Course Code: BIT118

L	T	P	Credits
3	0	0	3

Total Hours: 60

Learning Outcomes

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

1. Understand the used of fundamentals concepts and techniques in digital electronics
2. Examine the structure of various number systems and its application in digital design.
3. Analyze and design various combinational and sequential circuits.
4. Categorize a digital logic and apply it to solve real life problems.

Course Content

UNIT I **15 Hours**

Fundamentals of Digital Systems and logic families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples officiate, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lcs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tristate logic.

UNIT II **10 Hours**

Standard representation for logic functions: K-map representation and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder,ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT III **10 Hours**

Sequential circuits and systems :A 1-bit memory, the circuit properties of Bus table latch, the clocked SR flip flop, J- K-T and D-Types flip flops, applications of flip flops, shift registers,

applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, application counters, A/D and D/Converters Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, Specifications for D/A converters, examples of D/A converter lcs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converters.

UNIT IV **10 Hours**

Semiconductor memories and Programmable logic devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Transaction Modes: Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- R. P. Jain. (2009), *Modern Digital Electronics*, McGraw Hill Education.
- M. M. Mano. (2016). *Digital logic and Computer design*. Pearson Education India.
- A. Kumar. (2016). *Fundamentals of Digital Circuits*. Prentice Hall India.

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 and Computing Software Lab
Course Code: BIT113

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

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

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

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, VLOOKUP 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: BIT114

L	T	P	Credits
0	0	4	2

Total Hours: 30

Learning Outcomes

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

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

List of Experiments

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 quotients and remainder.
9. Write a program to accept the values of two variables.
10. Write a program using various unformatted input functions
11. Write a program to find area of rectangle and print the result using unformatted output functions
12. Write a program to find the larger of two numbers.
13. Write a program to find greater of three numbers using nested if.
14. Write a program to find whether the given number is even or odd.
15. Write a program to generate multiplication table using for loop
16. Write a program to generate multiplication table using while loop
17. Write a program to make a simple calculator using switch...case
18. Write a program to find whether the given number is a prime number.
19. Write a program using function to find the largest of three numbers
20. Write a program using a function to print the first 20 numbers and its squares.
21. Write a program to find the factorial of a given number.
22. Write a program to print the sum of two matrices
23. Write a program to find the length of a string

24. Write a program to copy string using strcpy()
25. Write a program to compare a string
26. Write a program to reverse a string
27. Write a program to reverse a string
28. Write a program to multiply two numbers using pointers.
29. Write a program to display address of variable using pointers
30. Write a program to show the memory occupied by structure and union.
31. Write a program to create student i-card using a structure
32. Write a program to read data from a file from a file
33. Write a program to save employee details in a file using file handling

Course Title: Communication Skills
Course Code: BIT119

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. Take a course overview of prerequisites to Business Communication and awareness of appropriate communication strategies.
2. Formulate an outline for effective Organizational Communication.
3. Summarize the information, ideas, concepts and opinions from a variety of sources.
4. Attain the competence in oral, written, and visual communication.

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 **8 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 **6 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/*
- *www.thebalancemoney.com/communication-skills-list-"*
- *www.skillsyouneed.com/ips/communication-skills.html*

SEMESTER II

Course Title: Operating Systems
Course Code: BIT211

L	T	P	Credits
4	0	0	4

Total Hours: 60

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

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

Course Content

UNIT I **14 hours**

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

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

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

UNIT II **16 hours**

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

UNIT III **14 hours**

I/O Device Management: I/O devices and controllers, device drivers; disk storage.

File Management: Basic concepts file operations, access methods, directory structures and management, remote file systems; file protection.

UNIT IV **16 hours**

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

Transactional Mode

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

Suggested Readings

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

Web Sources

Course Title: Programming Using C++
Course Code: BIT202

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Discuss about the programming techniques to solve problems or errors in the C++ programming language.
2. Compare the procedural and Object-Oriented paradigms.
3. Attain the conceptual knowledge of array and string.
4. Describe the constructor and class member function.

Course Content

UNIT I **16 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, In line functions, default arguments, const arguments, function overloading, Friend functions, Objects as function arguments, friendly functions, returning objects

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

UNIT III **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 **14 hours**

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

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

Transactional Mode

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

Suggested Readings

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

Web Search

-
- *{"https://www.guru99.com/operating-system-tutorial.html)"*
- *https://*

Course Title: Computer System Architecture
Course Code: BIT216

L	T	P	Credits
3	1	0	4

Total Hours: 45

Learning Outcomes

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

1. Knowledge about the architecture of the central processing unit.
2. Attain the knowledge of memory hierarchy.
3. Exemplify various data transfer modes.
4. Use the appropriate tools to design, verify and test the architecture of microprocessors.

Course Content

UNIT I **15 hours**

Computer System Organization: CPU Organization, 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 **10 hours**

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

UNIT III **10 hours**

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

UNIT IV **10 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:// organization*

Course Title: Operating Systems Lab
Course Code: BIT212

L	T	P	Credits
0	0	4	2

Total Hours: 30

Learning Outcomes

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

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

List of experiments

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

Course Title: Programming Using C++ Lab
Course Code: BIT205

L	T	P	Credits
0	0	4	2

Total Hours: 30

Learning Outcomes

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

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

List of experiments

1. Write a program to print 1
   12
   123
   1234
   123452
2. Write a program to find whether the number is even, odd.
3. Write a program to find the greatest out of three numbers.
4. Write a program to find whether the number is palindrome or not.
5. Write a program to print prime number Series.
6. Write a program to find the reverse of a number.
7. Write a program to find the factorial of a number.
8. Write a program using constructors in C++.
9. Write a program using destructors in C++.
10. Write a program using multiple constructors in C++.
11. Write a program using the Copy constructor in C++.
12. Write a program to demonstrate the single inheritance.
13. Write a program to demonstrate the multilevel inheritance.
14. Write a program to demonstrate the multiple inheritances.
15. Write a program showing hierarchical inheritance in C++.
16. Write a program to implement function overloading.
17. Write a program to demonstrate the overloading of binary arithmetic operators.
18. Write a program showing operator overloading in C++.
19. Write a program to demonstrate the use of function templates.
20. Write a program to demonstrate the use of class templates.
21. Write a program showing Exception handling in C++.
22. Write a program to read and write data from a file in C++.
23. Write a program to demonstrate the reading and writing of mixed type of data.
24. Write a program to demonstrate the reading and writing of object.

Course Title: Environmental Studies
Course Code: BIT214

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. 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. Appreciate the ethical, cross-cultural, and historical context of the social issues of environmental, and the links between human and natural systems, environment.

Course Content

UNIT I **10 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 **6 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 mega-diversity nation.

UNIT III **6 hours**

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

Course Title: Gender Equality
Course Code: BCA218

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes:

On successful completion of this course, the students will 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:

- *. Website:*
- *. Website:*
- *. Website:*

SEMESTER III

Course Title: Introduction to Python

Course Code: BIT310

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes:

On completion of this course, the students will be able to:

1. Discuss the variable, expression and statements.
2. Apply conditional and looping constructs.
3. Design and import functions in python programming.
4. Attain the basics of Strings and Dictionaries.

Course Content

UNIT I **14 hours**

Introduction to Python: Process of Computational Problem Solving, Python Programming Language Data and Expressions Literals, Variables and Identifiers, Operators, Expressions, Statements and Data Types

UNIT II **16 hours**

Control Structures: Boolean Expressions (Conditions), Logical Operators, Selection Control, Nested conditions, Debugging Lists: List Structures, Lists (Sequences) in Python, Iterating Over Lists (Sequences) in Python Functions: Fundamental Concepts, Program Routines, Flow of Execution, Parameters & Arguments

UNIT III **15 hours**

Iteration: While statement, Definite loops using For, Loop Patterns, Recursive Functions, Recursive Problem Solving, Iteration vs. Recursion Dictionaries: Dictionaries and Files, Looping and dictionaries, Advanced text parsing Files: Opening Files, Using Text Files, String Processing, Exception Handling.

UNIT IV **15 hours**

Objects and Their Use: Introduction to Object Oriented Programming Modular Design: Modules, Top-Down Design, Python Modules Using Databases and SQL: Database Concepts, SQLite Manager Firefox Add-on, SQL basic summary, Basic Data modeling, Programming with multiple tables

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://*

Course Title: Relational Database Management Systems

Course Code: BIT317

L	T	P	Credits
3	1	0	4

Total Hours: 60

Learning Outcomes

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

1. Identify the difference about database systems from the file systems by enumerating their features.
2. Acknowledge the role of the database administrator.
3. Retain the knowledge about physical and logical database designs.
4. Learn about three level architecture of database systems.

Course Content

UNIT I **14 hours**

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

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

UNIT II **16 hours**

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

UNIT III **14 hours**

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

UNIT IV **16 hours**

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

Transactional Mode

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

Suggested Readings

- *Ramakrishnan, R, Gehrke, J, &Gehrke, J. (2003), Database management systems (Vol. 3), New York: McGraw-Hill.KorthF, Henry, Database System Concepts, McGraw Hill.*
- *Lu, G. (1999). Multimedia database management systems, Boston: Artech House.*
- *Date, C. J. (1975), An introduction to database systems, Pearson Education India.*

Web Sources

- management-system-set-1/ management-systems-dbms

Course Title: Python Programming Lab
Course Code: BIT312

L	T	P	Credits
0	0	4	2

Total Hours: 30

Learning Outcomes

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

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

List of Experiments

1. Program to add two numbers and concatenate two strings.
2. Program to calculate simple interest and compound interest
3. Program to find factorial of a number.
4. Program to check whether entered number is palindrome or not.
5. Program to check whether entered number is Armstrong or not.
6. Program to check whether entered number is prime or not.
7. Program to print all prime numbers in a particular range.
8. Program to print Fibonacci series for n-th number.
9. Program to find smallest and largest number from a list.
10. Program to find smallest second and largest number from a list.
11. Program to print even numbers in a list.
12. Program to print odd numbers in a list.
13. Program to print all even numbers in a range
14. Program to print all odd numbers in a range
15. Program to print positive numbers in a list
16. Program to print negative numbers in a list.
17. Python program to Find the size of a Tuple
18. Python – Maximum and Minimum K elements in Tuple
19. Create a list of tuples from given list having number and its cube in each tuple
20. Python – Adding Tuple to List and vice – versa
21. Python – Closest Pair to Kth index element in Tuple
22. Python – Join Tuples if similar initial element
23. Program to implement linear search.
24. Program to implement binary search.

Course Title: Relational Database Management Systems Lab

Course Code: BIT319

L	T	P	Credits
0	0	4	2

Total Hours: 30

Learning Outcomes

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

1. Solve the query of the database using SQL DML / DDL commands.
2. Enforce integrity constraints on a database.
3. Apply the basic concepts of Database Systems and Applications.
4. Design a commercial relational database system (Oracle, My SQL) by writing SQL using the system.

List of Experiments

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

Course Title: Application Development using VB.NET

Course Code: BIT315

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

On the completion of the course the students will be able to

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

Course Content

UNIT I **12hours**

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

UNIT II **11hous**

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

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

Arrays and Strings: declaring and allocating Arrays, Using Strings and String functions: len, right, left, ucase, lcase, ltrim, trim; Control Arrays: Introduction, creating and using Control Arrays.

UNIT III **11hours**

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 **11hours**

Accessing Data with ADO.NET: Understanding ADO.net, ADO.NET Object model: Connected model and Disconnected model, architecture, components, Understanding Provider classes, using Data Reader to read data from database, Data Adapter and Data sets, Using Data Adapter for Data Navigation and Data Manipulation, connecting to and querying a data source, using Data Grid view control with ADO.NET data sources.

Transactional Mode

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

Suggested Readings

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

Web Sources

- *-net*
-
- *-to-net-*
-

Course Title: Programming using PHP
Course Code: BIT316

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Implement the PHP basics i.e. web server, Text editor (Sublines, Dreamweaver).
2. Demonstrate about the concept of operators, Conditional and loops.
3. Develop the functional PHP script.
4. Design a My SQL database.

Course Content

UNIT I **12 hours**

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

UNIT II **11 hours**

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

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

UNIT III **10 hours**

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

UNIT IV **12 hours**

String Manipulation and Regular Expression: Creating and accessing String, Searching & Replacing String, Formatting, joining

and splitting String, String Related Library functions, Use and advantage of regular expression over inbuilt function, Use of preg_match(), preg_replace(), preg_split() functions in regular expression.

Transactional Mode

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

Suggested Readings

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

Web Sources

-
-
-

Course Title: Artificial Intelligence
Course Code: BIT320

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Solve the basic AI based problems.
2. Knowledge about Prepositional logic.
3. Analyze the MYCIN expert system.
4. Discuss the concept of Artificial Intelligence.

Course Content

UNIT I **12 hours**

Introduction: What are AI, Importance of AI, and Early work in AI, Applications of AI, Knowledge and its definition? Knowledge Representation: Prepositional logic, FOPL, Properties of Well-formed formulas, Conversion to Clausal form, Inference rules.

UNIT II **10 hours**

Structured Knowledge: Introduction, Associate frame structures, Conceptual dependencies and scripts.
Knowledge Organization and Manipulation: Concepts, Uninformed or Blind search, Pattern Recognition, Recognition Classification process, Classification patterns.

UNIT III **13 hours**

Expert System: Definition, Rule based architecture, Knowledge acquisition and validation, MYCIN Expert System.

UNIT IV **10 hours**

Knowledge Acquisition: Types of learning, General Learning model, Performance measures.

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

-
-
-
-
-

Parallel Processing
Code: BIT321

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

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

1. Learn fundamental concepts of concurrency and parallelism.
2. Attain the major concepts and ideas in parallel computing and its applications.
3. Measure runtime performance of parallel programs and improve performance bottlenecks.
4. Compare the various models of parallelism (e.g., shared versus distributed memory models) and their strengths and limitations.

Course Content

UNIT I **10 hours**

Introduction: Paradigms of parallel computing: Synchronous-vector/array, SIMD, Systolic; Asynchronous -MIMD,
Hardware taxonomy: Flynn's classifications, Handler's classifications. Software taxonomy: Kung's taxonomy.

UNIT II **12 hours**

Abstract parallel computational models: Combinational circuits, Sorting network, PRAM models, Interconnection RAMs. Parallelism approaches - data parallelism, control parallelism
Performance Metrics: Laws governing performance measurements. Matrices - speedups, efficiency, communication overheads, single/multiple program performances.

UNIT III **12 hours**

Parallel Processors: Taxonomy and topology - shared memory multiprocessors, distributed memory networks, Processor organization - Static and dynamic interconnections, Embedding's and simulations.

UNIT IV **11 hours**

Parallel Programming: Shared memory programming, distributed memory programming, object oriented programming, data parallel programming, functional programming.

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

Transaction Mode

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

Suggested Readings

- *Krishnamurthy, E. V. (1990), Parallel processing: principles and practice,Addison-Wesley Longman Publishing Co., Inc..*
- *LewisT.G. Parallel Programming: A Machine-Independent Approach, IEEE Computer Society Press, Los Alamitos, (1994).*

Web Sources

- *processing#:~:text=Parallel%20processing%20is%20a%20method,time % 20to%20run%20a%20program.*
- *processing/*

Course Title: Digital Marketing
Course Code: OEC013

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes:

1. After completion of this course, the learner will be able to:
2. Understanding the digital marketing concepts and its usefulness in business.
3. Planning steps for digital marketing strategy and successfully executing it.
4. Applying Search Engine Optimization techniques (SEO) and Search Engine Marketing (SEM) to maximize reach and enhance engagement of users.
5. Analyzing web using analytics tools and gaining insights to various tools for Social Media Marketing.

Course Content

UNIT I **8hours**

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 **7hours**

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 **8hours**

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 **7hour**

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*
-

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: Data Structure

Course Code: BIT409

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Apply appropriate constructsof Programming language, coding standards for application development
2. Select appropriate data structures for problem solving and programming
3. Evaluate and choose appropriate searching and/or sorting techniques for various problem types and data structures.
4. Differentiate and classify different types of data structures based on their characteristics and use cases.

Course Content

UNIT I **14 hours**

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

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

UNIT II **16 hours**

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

UNIT III **14 hours**

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

Trees: Introduction to Tree, Tree Terminology Binary Tree, Binary

Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree.

UNIT IV **16 hours**

Graphs, Searching, Sorting and Hashing Graphs: Introduction, Representation to Graphs, Graph Traversals Shortest Path Algorithms.

Searching and Sorting: Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort.

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

Transactional Mode

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

Suggested Readings

- *Hubbard, J. R. (2007), [Introduction to] Schaum's Outline of Data Structures with Java, McGraw-Hill.*
- *Horowitz, E, &Sahni, S, (1976), Fundamentals of data structures (Vol. 1982),Potomac, MD: Computer science press.*
- *Wirth, N, (1985), Algorithms & data structures, Prentice-Hall, Inc..*
- *Tarjan, R. E, (1983), Data structures and network algorithms, Society for industrial and Applied Mathematics.*

Web Sources

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

Course Title: Data Communication
Course Code: BIT419

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

On the completion of the course, the students 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 layer and network protocols.

Course Content

UNIT I **12 Hours**

Internet Basics Internet: Growth, Architecture, Accessing, Internet Service Providers (ISP), Internet Addressing System: IP Address, DNS, URL; World Wide Web (WWW): Web Servers, Web Browsers, Search Engine; Concept of Intranet & Extranet.

UNIT II **16 Hours**

Network Models Design Issues of the Layer, Protocol Hierarchy, ISO-OSI Reference Model: Functions of each Layer, Various Terminology used in Computer Network, Connection-Oriented & Connectionless Services, Internet (TCP/IP) Reference Model, Comparison of ISO-OSI and TCP/IP Model

UNIT III **16 Hours**

Basics of Computer Network Computer Network: Definition, Goals, Structure; Broadcast and Point-To Point Networks; Network Topology and their various Types; Types of Networks: LAN, MAN, WAN; Server Based LANs & Peer-to-Peer LANs; Communications Types: Synchronous, Asynchronous; Modes of Communication: Simplex, Half Duplex, Full Duplex; Protocols and Standards.

UNIT IV **16 Hours**

Routing Algorithms: Optimality principled, shortest path routing, Concept of Internet Working. Overview of DNS protocol; overview of WWW & HTTP protocol.

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

Suggested Readings

- *Storytelling with Data" by Cole Nussbaumer Knaflic*
- *Data Visualization: A Practical Introduction" by Kieran Healy*

Web Sources

- *www.learn.g2.com/ open-data-sources*

Course Title: Basic of Statistical Methods
Course Code: BIT420

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes

On the completion of the course the students will be able to

1. understand the numerical solution of algebraic, transcendental and system of linear equations.
2. apply the concept of interpolation and extrapolation for the given data sets.
3. understand the concept of solving integration and differential equations numerically for various real world problems.
4. apply the statistical measurements in different problems.

Course Content

UNIT I **8hours**

Measures of Central tendency: Introduction to Central Tendency, Purpose and Characteristics of a Good Average, Types of Averages, Arithmetic Mean, Merit and Demerits of Arithmetic Mean, Median, Merit and Demerits of Median, Mode, Calculation of Mode, Merit and Demerits of Mode.

UNIT II **6hours**

Dispersion: Meaning of Dispersion, Objectives of Dispersion, Measure of Dispersion, Methods of Measuring Dispersion, Range: Introduction, Merit and Demerits of Range, Mean Deviation, Standard Deviation, Coefficient of Variation.

UNIT III **8hours**

Correlation: Meaning and types of correlation, correlation and causation, Methods of correlation: Karl Pearson correlation coefficient, rank correlation coefficient.

UNIT IV **8hours**

Regression analysis: Linear regression - method of least squares for estimation of regression coefficient.

Transactional Mode

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

Suggested Readings

- *V. Rajaraman: Computer Oriented Numerical Methods, Prentice Hall of India Private Ltd., New Delhi.*
- *B.S. Grewal, Numerical Methods for Engineering, Sultan Chand Publication.*
- M K. Jain, S.R.K. Iyengar and R.K. Jain," Numerical Methods for Scientific and Engineering Computation", Wiley Eastern Limited, New Delhi.

Web Sources

- *https://mu.ac.in/wp-content/uploads/2021/06/USIT204-Numerical-and- Statistical-methods.*

Course Title: Data Structures Lab
Course Code: BIT412

L	T	P	Credits
0	0	4	2

Total Hours: 30

Learning Outcomes

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

1. Identify the time and space complexity of the data structures.
2. Summarize the searching and sorting techniques.
3. Implement the stack, queue and linked list operation.
4. Analyze the elementary sorting algorithms such as Selection sort, Bubble sort, Insertion sort, and Shell sort and Searching techniques.

List of experiments

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

Course Title: Minor Project
Course Code: BIT413

L	T	P	Credits
0	0	4	2

Total Hours: 30

Course Description:

The Minor Project course in B.Sc.IT 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: Ethical Hacking
Course Code: BIT408

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. Evaluate new Hacking Methodology.
2. Install hacking software on a closed network environment.
3. Exemplify security techniques used to protect system and user data.
4. Get knowledge about report writing and mitigation.

Course Content

UNIT I **8 hours**

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

UNIT II **7 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
-
-
-

Course Title: Theory Of Computation
Course Code: BIT414

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Analyze the concept of cybercrimes.
2. Knowledge about the regulation of cyberspace at national and international level.
3. Describe the international legal regime related to cybercrimes.
4. Discuss the offenses and penalties under it act 2000.

Course Content

UNIT I **13 hour**

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

UNIT II **10 hours**

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

UNIT III **10 hours**

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

UNIT IV **12 hours**

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

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

-
-
-

Course Title: Deep Learning
Course Code: BIT418

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

On the completion of the course, students will be able to:

1. Understand the fundamental principles of deep learning.
2. Comprehend the structure and functioning of neural networks.
3. Analyze different types of neural network architectures.
4. Recognize applications of deep learning in various domains.

Course Content

UNIT I **10 hours**

Introduction to Deep Learning: Overview, history, importance. Basic Concepts: Neurons, weights, activation functions, and layers. Neural Networks: Introduction to neural network architectures and learning paradigms.

UNIT II **11 hours**

Feedforward Networks: Structure, forward propagation. Backpropagation: Gradient descent, cost functions, learning rate. Overfitting and Underfitting: Causes, consequences, and remedies.

UNIT III **11 hours**

Convolution Operations: Filters, strides, padding, pooling. CNN Architectures: Basic layers and their roles, simple architecture examples. Applications of CNNs: Image classification, basic concepts.

UNIT IV **13 hours**

RNN Basics: Sequence data, recurrent connections. Variants of RNNs: LSTM, GRU. Applications of RNNs: Simple examples in text and speech. Generative Models: Basic concepts of GANs (Generative Adversarial Networks).Reinforcement Learning: Basic principles and applications.

Transaction Mode:

Lecture Method, Video-based learning, Demonstrations, Peer Discussion Collaborative Learning

Suggested Readings:

- *Goodfellow, I, Bengio, Y, & Courville, A, (2016), Deep Learning, MIT Press.*
- *Chollet, F, (2018), Deep Learning with Python, Manning Publications.*
- *Brownlee, J, (2016), Deep Learning with Python: Develop Deep Learning Models on Theano and TensorFlow Using Keras, Machine Learning Mastery.*

Web Sources:

- *, F. (2018). Deep Learning with Python. Manning Publications.*
- -
- -
-

Course Title: Big Data
Course Code: BIT416

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Discuss the building blocks of Big Data.
2. Articulate the programming aspects of cloud computing (map Reduce etc.).
3. Represent the analytical aspects of Big Data.
4. Knowledge about the recent research trends related to Hadoop File System, Map Reduce and Google File System etc.

Course Content

UNIT I **14 hours**

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

UNIT II **09 hours**

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

UNIT III **10 hours**

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

UNIT IV **12 hours**

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

Transactional Mode

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

Suggested Readings

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

Web Sources

-
-
-
- *https://cloud.google.com/learn/what-is-big-data*

Course Title: Digital Image Processing
Course Code: BIT417

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

Course Content

Unit I **11 hours**

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

Unit II **11 hours**

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

Unit III **11 hours**

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

Unit IV **12 hours**

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

Thresholding, Region Based Segmentation.

Suggested Readings

- *Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins.*
- *by Rafael C. Gonzalez*
- *and Programs (The MIT Press)by Steven L. Tanimoto*

Web Sources

-
-
- *https://freecomputerbooks.com/Digital-Image-Processing.html*

SEMESTER V

Course Title: Programming Using Java
Course Code: BIT509

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

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

Course Content

UNIT I **14 hours**

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

UNIT II **16 hours**

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

-
-
-
- *-objects*

Course Title: Computer Networks
Course Code: BIT502

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

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

Course Content

UNIT I **14 hours**

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

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

UNIT II **16 hours**

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

UNIT III **14 hours**

Network reference models: Network topologies, OSI references model, TCP/IP reference model, comparison of OSI and TCI 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

- *components-types-channels/*
-
-

Course Title: Programming Using Java Lab
Course Code: BIT510

L	T	P	Credits
0	0	4	2

Total Hours: 30

Learning Outcomes

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

1. Discuss about the concepts of object-oriented programming.
2. Test the performance of Exception handling and multi-threading.
3. Apply the concepts of packages to develop efficient and error free codes.
4. Implementing and Debugging the Java programs.

List of experiments

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 make use of control Statement like Try, catch, finally, throw, and throw.
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: Computer Networks Lab
Course Code: BIT513

L	T	P	Credits
0	0	4	2

Total Hours: 30

Learning Outcomes:

On the completion of the course, students will be able to:

1. Students will be able to differentiate between digital and analog signals and understand the concepts of parallel and serial transmission.
2. Students will comprehend the characteristics of synchronous and asynchronous communication modes and distinguish between simplex, half duplex, and full duplex transmission.
3. Students will gain knowledge about various wired transmission mediums such as telephone lines, leased lines, coaxial cables, and optical fiber transmission.
4. They will understand the characteristics and applications of different wireless transmission technologies including microwave, infrared, laser, radio, and satellite transmission.

Course Content

1. Management (creation, modification and deletion of left users) of the users & their domain.
2. Setting up the local security policy for the system, software.
3. Maintaining your system in Linux Networking and Setup Linux for firewall and IP filtering.
4. Configure the kernel for IP Accounting and IP Masquerade.
5. Install send mail distribution and create send mail configuration files.
6. Start and stop services from user window and command prompt.
7. Use of event viewer and performance monitor.
8. Management of the IIS and FTP server.

Course Title: Internship Training* 6 Weeks
Course Code: BIT511

L	T	P	Credits
0	0	0	6

Course Description:
The Internship Training program in B.Sc.IT provides students with 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: BIT519

L	T	P	Credits
2	0	0	2

Total Hours: 30

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
4. "The Key Muscles of Yoga" by Ray Long

Course Title: Data Warehouse and Data Mining
Course Code: BIT508

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Identify the scope and necessity of Data Mining & Warehousing for the society.
2. Describe the designing of Data Warehousing so that it can be able to solve the root problems.
3. Remove redundancy and incomplete data from the dataset using data preprocessing methods.
4. Develop a data mining application for data analysis using various tools.

Course Content

UNIT I **10 hours**

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

UNIT II **12 hours**

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

UNIT III **11 hours**

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

UNIT IV **12 hours**

Cluster Analysis: Introduction, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods,

Hierarchical Methods, Density-Based Methods, and Grid Based Methods; Model Based Clustering Methods, Outlier Analysis.

Transactional Mode

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

Suggested Readings

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

Web Sources

-
-
- *https:// warehousing-and-data-mining/*
-

Course Title: Machine Learning
Course Code: BIT512

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes:

On completion of this course the students will be able to:

1. Describe the basic concepts of Bayesian Decision Theory.
2. Examine the Machine Intelligence and its applications
3. Implement the working of perceptron learning algorithm, criterion and Windrow-Hoff learning algorithm.
4. Evaluate the models generated from data.

Course Content

UNIT I **8 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 **14 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's: two-layers universal approximates, back propagation learning, on-line, off-line error surface, important parameters.

UNIT III **10 Hours**

Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data
Instance-based Learning: Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability.

UNIT IV **13 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, Tradeoffs.

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

-
-
-
-
-

SEMESTER VI

Course Title: Computer Graphics
Course Code: BIT601

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Provide comprehensive introduction about computer graphics systems, design algorithms and two-dimensional transformations.
2. Knowledge about the techniques of clipping, three-dimensional graphics.
3. Acknowledge the relation between the images displayed on screen.
4. Involve in various design activities such as testing, rendering, shading and animation.

Course Content

UNIT I **16 hours**

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

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

UNIT II **14 hours**

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

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

UNIT III **16 hours**

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

UNIT IV **14 hours**

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

Transactional modes

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

Suggested Readings

- *Hearn, D, Baker, M. P, & 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

-
-
-

Course Title: Software Engineering
Course Code: BIT610

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Figure out the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction and deployment.
2. Review the techniques of software lifecycle.
3. Gain knowledge about DFDs, Entity Relationship diagrams etc.
4. Perform the various testing techniques.

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

-
-
-

Course Title: Computer Graphics Lab
Course Code: BIT603

L	T	P	Credits
0	0	4	2

Total Hours: 30

Learning Outcomes

1. After completion of this course, the learner will be able to:
2. Apply mathematics and logic to develop Computer programs for elementary graphic operations
3. Implement the Flood Fill Algorithm.
4. Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics
5. Develop the competency to understand the concepts related to Computer Vision and Virtual reality

Course Content

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

Course Title: Major Project
Course Code: BIT611

L	T	P	Credits
0	0	8	4

Total Hours: 60

Learning Outcomes

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

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

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: BIT612

L	T	P	Credits
0	0	4	2

Total Hours: 30

Course Content

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

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

Transaction Mode

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

Suggest Reading

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

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

Course Title: E-Business
Course Code: BCA617

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.
2. The objective is to expose the students to electronic modes of commercial operations.
3. 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: Internet of Things
Course Code: BIT613

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

On completion of the course, student 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", WileyPublications*
- *Vijay Madisetti and ArshdeepBahga, — "Internet of Things (A Hands-on- Approach)", 1 st 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:

-
- *ges.*

Course Title: Introduction to Cloud Computing
Course Code: BIT614

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

1. Gain insight about basic technology behind the Cloud.
2. Comprehend the Cloud computing applications.
3. Learn the models and services of cloud technology.
4. Accessing the cloud and system testing.
5. Understand the financial considerations and benefits of adopting cloud services.

Course Content

UNIT I **12 hours**

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

UNIT II **10 hours**

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

UNIT III **10 hours**

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

UNIT IV **13 hours**

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

Transactional modes

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

Suggested Readings

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

Web Sources

-
-
-
-
-
-

Course Title: Data Visualization Using R
Course Code: BIT615

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

On completion of this course, a student 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 **11hours**

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

Unit II **11hours**

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

Unit III **11hours**

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://intellipaat.com/blog/tutorial/r-programming/data-visualization-in-r/*

Course Title: Neural Networks
Course Code: BIT616

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

On completion of this course, a student will be able to

1. Understanding Neural Network Fundamentals.
2. Proficiency in Multilayer Perceptron's (MLPs).
3. Application of Convolutional Neural Networks (CNNs).
4. Mastery of Recurrent Neural Networks (RNNs) and Applications.

UnitI **11hours**

Introduction to Neural Networks Overview of Artificial Neural Networks (ANNs) Biological inspiration behind ANNs Basic structure of a neuron Types of neurons: input, hidden, output Activation functions: sigmoid, ReLU, tanh Feedforward propagation.

Unit II **11hours**

Multilayer Perceptrons (MLPs) Introduction to Multilayer Perceptrons Architecture of MLPs Backpropagation algorithm Gradient descent optimization techniques: Batch Gradient Descent, Stochastic Gradient Descent, Mini-batch Gradient Descent Training and testing neural networks Overfitting and techniques to mitigate it: dropout, regularization

Unit III **11 hours**

Convolutional Neural Networks (CNNs) Introduction to Convolutional Neural Networks Convolutional layers: filters, feature maps Pooling layers: max pooling, average pooling Architecture of CNNs Common CNN architectures: LeNet, AlexNet, VGG, ResNet Transfer learning with CNNs Applications of CNNs: image classification, object detection, image segmentation.

Unit IV **11hours**

Recurrent Neural Networks (RNNs) and Applications Introduction to Recurrent Neural Networks Architecture of RNNs Backpropagation through time (BPTT) Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU) networks Applications of RNNs: sequential data processing, natural language processing, time series prediction Sequence-to-sequence models Attention mechanisms in RNNs.

Suggested Reading:

"Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

"Neural Networks and Deep Learning: A Textbook" by Charu C. Aggarwal.

"Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron

Web Sourses:

Tensor Flow Tutorials

PyTorch Tutorials

https://www.tutorialspoint.com/android/index.html"