GURU KASHI UNIVERSITY

Bachelor of Science (Information Technology)

2023-24

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

Semester I							
Course Code	Course Title	Type of Course	L	T	P	Credits
BIT111	Computer Fundamentals & Computing Software	Core	4	0	0	4
BIT112	Programming Using C	Core	4	0	0	4
BIT104	Communication skills	Compulsory Foundation	2	0	2	3
BIT113	Computer Fundamentals & Computing Software Lab	Technical skill	0	0	4	2
BIT114	Programming Using C Lab	Technical skill	0	0	4	2
BIT199	XXXX	MOOC	-	-	-	2
Disciplinary Elective- I (Any one of the following)						
BIT115	E-Business	Disciplinary Elective- I	3	0	0	3
BIT116	Information System Design and Implementation					
Total			**13**	**0**	**10**	**20**

Semester II						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BIT211	Operating Systems	Core	4	0	0	4
BIT202	Programming Using C++	Core	4	0	0	4
BIT212	Operating Systems Lab	Technical skill	0	0	4	2
BIT205	Programming Using C++ Lab	Technical skill	0	0	4	2
BIT213	PC assembling & Troubleshooting Laboratory	Technical skill	0	0	4	2
BIT214	Environmental Studies	Compulsory Foundation	1	0	0	1
BIT215	Introduction to Human Resource Management	Skill Based	2	0	0	2
BCA218	Gender Equality	Value Added Course	2	0	0	2
Disciplinary Elective- II (Any one of the following)						
BIT216	Computer System Architecture	Disciplinary Elective-II	3	0	0	3
BIT217	Digital Electronics					
Total			**16**	**0**	**12**	**22**

Semester III						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credit**
BIT310	Introduction to Python	Core	4	0	0	4
BIT311	Database Management Systems	Core	4	0	0	4
BIT312	Introduction to Python Lab	Technical skill	0	0	4	2
BIT313	Database Management Systems Lab	Technical skill	0	0	4	2
BIT314	Workshop on Multimedia	Technical skill	0	0	2	1
BIT399	XXXX	MOOC	-	-	-	2
Disciplinary Elective- III (Any one of the following)						
BIT315	Application Development using VB.NET	Disciplinary Elective- III	3	0	0	3
BIT316	Programming using PHP					
Open Elective Course						
XXX			2	0	0	2
Total			**13**	**0**	**10**	**20**
Open Elective Courses (For other Departments)						
BIT309	Digital Marketing	OEC	2	0	0	2

Semester IV						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BIT409	Data Structures	Core	4	0	0	4
BIT410	Discrete Mathematics	Core	4	0	0	4
BIT411	Artificial Intelligence	Core	4	0	0	4
BIT412	Data Structures Lab	Technical skill	0	0	4	2
BIT413	Minor Project	Technical skill	0	0	4	2
Disciplinary Elective- IV (Any one of the following)						
BIT414	Theory Of Computation	Disciplinary Elective- IV	3	0	0	3
BIT415	Parallel Processing					
Disciplinary Elective-V (Any one of the following)						
BIT416	Big Data	Disciplinary Elective-V	3	0	0	3
BIT417	Digital Image Processing					
Value Added Course(For other Departments also)						
BIT408	Ethical Hacking	VAC	2	0	0	2
Total			**20**	**0**	**8**	**24**

Semester V						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
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	2	1
BIT511	Internship Training* 6 Weeks	Internship	-	-	-	6
BIT599	XXXX	MOOC	-	-	-	2
Disciplinary Elective-VI (Any one of the following)						
BIT508	Data Warehouse and Mining	Disciplinary Elective-VI	3	0	0	3
BIT512	Machine Learning					
Total			**11**	**0**	**2**	**20**
Note: *After fourth semester during summer vacation.						

Semester VI						
Course Code	**Course Title**	**Course Type**	**L**	**T**	**P**	**Credits**
BIT610	Software Engineering	Core	4	0	0	4
BIT601	Computer Graphics	Core	4	0	0	4
BIT603	Computer Graphics Lab	Technical skill	0	0	4	2
BIT611	Major Project	Technical skill	0	0	4	2
BIT612	Service Learning	Skill Based	0	0	4	2
Disciplinary Elective-VI (Any one of the following)						
BIT613	Internet of Things	Disciplinary Elective-VI	3	0	0	3
BIT614	Introduction to Cloud Computing					
Disciplinary Elective-VII (Any one of the following)						
BIT608	Android Programming	Disciplinary Elective-VIII	3	0	0	3
BIT615	Data Visualization using R					
Total			**14**	**0**	**12**	**20**
Grand Total			**85**	**0**	**54**	**124**

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

L	**T**	**P**	**Credits**
4	**0**	**0**	**4**

**Course Title: Computer Fundamentals &
Computing Software**
Course Code: BIT111

Total Hours: 60

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.
2. Analyze the concept of computer devices and recognition of the basic terms used in computer programming.
3. Identify and learn the details of the components of a personal computer system.
4. Demonstrate the functions of computer programming languages.

Course Content

UNIT I   **15 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   **15 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   **15 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 **15 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;

Adding database functions: defining database ranges, sorting, filtering and grouping database ranges; Evaluating data: using Data Pilot;

Functions and Macros: using and editing existing macro, Creating Macros, Recording Macros, Running Macros.

Presentation Packages: Basics of creating a presentation, Parts of main window, workspace views, creating a presentation, Incorporation of Animation.

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
- https://www.tutorialspoint.com/computer_fundamentals/computer_fundamentals_tutorial.pdf

	L	T	P	Credits
Course Title: Programming using C	**4**	**0**	**0**	**4**
Course Code: BIT112				

Total Hours: 60

Learning Outcomes

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

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

Course Content

UNIT I 14 hours

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

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

UNIT II 16 hours

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

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

UNIT III 16 hours

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

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

UNIT IV 14 hours

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

File Handling: Introduction, creating a data file, opening and closing a data file, file Pointers, file accessing functions (fopen, fclose, putc, getc, fprint); 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/
- https://www.includehelp.com/c-programming-examples-solved-c-programs.aspx
- https://www.studocu.com/in/document/bengaluru-north-university/bca/problem-solving-techniques-using-c/16264070

	L	T	P	Credits

Course Title: Communication Skills
Course Code: BIT104

L	T	P	Credits
2	0	2	3

Total Hours: 60

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   16 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   14 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   12 hours

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

UNIT IV   18 hours

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

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

Transaction Mode

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

Suggested Readings

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

Web Sources

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

**Course Title: Computer Fundamentals &
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	**L**	**T**	**P**	**Credits**
Course Code: BIT114	**0**	**0**	**4**	**2**

Total Hours: 60

Learning Outcomes

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

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

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

	L	**T**	**P**	**Credits**

Course Title: E-Business
Course Code: BIT115

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 an understanding of fundamental concepts and technologies in the field of E-Commerce and Governance.
2. Apply knowledge about various Electronic Payment Systems.
3. Analyze different types of Governance Process Models.

Evaluate ethical, social, and security issues related to online transactions.

Course Content

UNIT I   **15 hours**

E – Commerce: Its definition, aims, process tools and results, EDI, VAN's and internet as Promoters, Types of E – Commerce, Commerce – net. Steps to Start E – Commerce: H/W & S/W Requirements, steps involved in opening your own online business.

EDI: EDI Vs Traditional Systems, EDI enabled procurement process, components of EDI system, EDI implementation issues.

UNIT II   **10 hours**

Concerns for E – Commerce: Basic challenges to E – Commerce, Technological, legal and regulators heads, Internet Bandwidth & Technological Issues. NII: Technical issues, standards & Services GII, Issues that confront us in relation to securing electronic transactions. Implementation of digital signatures. Authentication Mechanisms.

UNIT III   **10 hours**

Electronic cash, its elements, legal issues, risks, paper document versus Electronic Document Laws for E – Commerce legal issues for Internet Commerce. Re – Engineering for Change: Business process re – engineering BPR, Methodology Planning Methods for change to EC / EDI.

UNIT IV   **10 hours**

E – Commerce in India: EDI service providers in India, EDI Projects in the Government regulatory agencies. The Internet in India, laws for E – Commerce in India.

Suggested Readings

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

Web Sources

● https://simplycoding.in/e-commerce-and-e-governance-notes/

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

	L	**T**	**P**	**Credits**

Course Title: Information System Design & Implementation
Course Code: BIT116

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 about the various aspects of Information Systems to developed their analysis and design.
2. Aware about pre requisites of software development and associated paradigms.
3. Analyze and design information systems.
4. Awareness of security and privacy considerations in information system design and implementation.

Course Content

UNIT I   **13 hours**

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

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

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

UNIT II   **12 hours**

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

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

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

UNIT III   **10 hours**

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

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

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

UNIT IV   **10 hours**

Implementation and Software Maintenance: Introduction, Conversion-Activity network for Conversion, File Conversion

User Training: Elements of user Training Post implementation review. Software Maintenance - Primary activities of a Maintenance Procedure, Reducing Maintenance Costs.

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

Transactional Mode

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

Suggested Readings

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

Web Sources

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

Semester II

Course Title: Operating Systems	L	T	P	Credits
Course Code: BIT211	4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Describe the fundamental concepts of Operating System.
2. Solve the various types of Scheduling Algorithms for better utilization of external memory.
3. 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

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

	L	**T**	**P**	**Credits**
Course Title: Programming using C++	**4**	**0**	**0**	**4**
Course Code: BIT202				

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

Course Title: Operating Systems Lab	**L**	**T**	**P**	**Credits**
Course Code: BIT212	**0**	**0**	**4**	**2**

Total Hours: 60

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

	L	**T**	**P**	**Credits**

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

L	**T**	**P**	**Credits**
0	**0**	**4**	**2**

Total Hours: 60

Learning Outcomes

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

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

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: Pc Assembling & Troubleshooting Laboratory

Course Code: BIT213

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

List of experiments

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

	L	T	P	Credits
	1	0	0	1

Course Title: Environmental Studies
Course Code: BIT214

Total Hours: 15

Learning Outcomes

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

1. Acquire the basic knowledge of Environment study.
2. 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   **4 hours**

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

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

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

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

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

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

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

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

UNIT II   **3 hours**

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

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

UNIT III   4 hours

Environmental Pollution Definition: Causes, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution 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   4 hours

Social Issues and the Environment: From Unsustainable to Sustainable development, urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns,

Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Presentation and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation.

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

Transactional Mode

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

Suggested Readings

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

Web Sources

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

Course Title: Introduction to Human Resource Management	L	T	P	Credits
Course Code: BIT215	2	0	0	2

Course Content   **Total Hours: 30**

Learning Outcomes

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

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

Course Content

UNIT I   **8 hours**

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

UNIT II   **9 hours**

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

UNIT III   **6 hours**

Method of Wage Payment – Employee Remuneration Factors Determining the Level of Remuneration-Profit Sharing –Fringe Benefit

Nature of E-HRM, E-HR Activity, E-Recruitment, E-Selection, E-Learning, E-Compensation.

UNIT IV   **7 hours**

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

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

Transactional Mode

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

Suggested Readings

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

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

Course Title: Computer System Architecture
Course Code: BIT216

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes

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

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

Course Content

UNIT I   **15 hours**

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

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

UNIT II   **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://www.studytonight.com/computer-architecture/input-output-organisation*
- *https://www.javatpoint.com/computer-organization-and-architecture-tutorial*
- *https://4291519971640327878.weebly.com/blog/13-computer-system-architecture*
- https://www.geeksforgeeks.org/microarchitecture-and-instruction-set-architecture/

Course Title: Digital Electronics	**L**	**T**	**P**	**Credits**
Course Code: BIT217	**3**	**0**	**0**	**3**

Total Hours: 45

Learning Outcomes

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

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

Course Content

UNIT I   15 hours

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

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

UNIT II   15 hours

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

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

UNIT III   15 hours

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

UNIT IV   15 hours

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

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

Transactional Mode

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

Suggested Readings

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

Web Sources

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

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

Course Title: Database Management Systems	L	T	P	Credits
Course Code: BIT311	4	0	0	4

Total Hours: 60

Learning Outcomes

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

1. Identify the difference about database systems from the file systems by enumerating their features.
2. 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

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

BSc.IT (BIT23)

Course Title: Introduction to Python Lab
Course Code: BIT312

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes

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

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

List of Experiments

Program 1: hello world
Program 2: add numbers and concatenate strings
Program 3: input from user
Program 4: loops
Program 5: if-else - conditional checking
Program 6: functions
Program 7: math library
Program 8: strings
Program 9: exceptional handling
Program 10: random numbers/string
Program 11: demo of data structure - list
Program 12: demo of data structure - dictionary
Program 13: demo of data structure – tuple
Program 14: command line argument

Course Title: Database Management Systems Lab	L	T	P	Credits
Course Code: BIT313	0	0	4	2

Total Hours: 60

Learning Outcomes

After completion of this course, the learner will be able to:
1. Solve the query of the database using SQL DML / DDL commands.
2. Enforce integrity constraints on a database.
3. Apply the basic concepts of Database Systems and Applications.
4. Design a commercial relational database system (Oracle, My SQL) by writing SQL using the system.

List of Experiments

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

Course Title: Workshop on Multimedia Lab	L	T	P	Credits
Course Code: BIT314	0	0	2	1

Total Hours: 30

Learning Outcomes

After completion of this course, the learner will be able to:
1. Learn about the different tools for multimedia processing.
2. Draw the image with proper animation.
3. Design the images with appropriate tools from the toolbox.
4. Gain the practical knowledge of image animations.

Course Content

1. Procedure to create an animation to represent the growing moon.
2. Procedure to create an animation to indicate a wall bouncing on steps.
3. Procedure to simulate movement of a cloud.
4. Procedure to draw the fan blades and to give proper animation.
5. Procedure to display the background given through your name.
6. Procedure to create an animation with the following features:

   WEL COMELetter should appear one by one.The fill Color of the text should change to a different Color after the display of full word.
7. Procedure to simulate a ball hitting another ball.
8. Procedure to create an animated cursor using STARTDRAG ("SS", TRUE); MOUSE. HIDE ();
9. Procedure to design a visiting card containing at least one graphic and text information.
10. Procedure to take a photographic image. Give the title for the image and put the border. Write your names. Write the institution and place.
11. Procedure to prepare a cover page for the book in your subject area. Plan your own design.
12. . Selecting   your own background for organization.
13. Picture so that it gives an elegant look.
14. Procedure to picture preferably on a plain background of a color of your Choice-Positioning Includes rotation and scaling.
15. Procedure to remove the arrows and text from the given photographic image.
16. Procedure to type a word and apply the effects shadow embossed.
17. Procedure to use appropriate tools(s) from the toolbox cut the object from three files, organize them in a single file and apply feather effects.
18. Procedure to display the background given through your name using a mask.

19. Procedure to make anyone of one of the parrots black and white in a given picture.
20. Procedure to change a circle into a square using flash.

Course Title: Application Development using VB.NET	L	T	P	Credits
	3	**0**	**0**	**3**

Course Code: BIT315

Total Hours 45

Learning Outcomes

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

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

Course Content

UNIT I   **10 hours**

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

UNIT II   **15 hours**

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

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

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

Control Arrays: Introduction, creating and using Control Arrays

UNIT III   **10 hours**

Writing ASP .NET applications and Deploying ASP .NET Applications: Introduction to ASP.NET, Difference between ASP and ASP.NET, Understanding Web Forms, Using Validation Controls: RequiredFieldValidator, RangeValidator, CompareValidator, RegularExpressionValidator, CustomValidator, 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   **10 hours**

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

Transactional Mode

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

Suggested Readings

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

Web Sources

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

Course Title: Programming using PHP	L	T	P	Credits
Course Code: BIT316	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

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

	L	T	P	Credits
Course Title: Digital Marketing	2	0	0	2
Course Code: BIT309				

Total Hours: 30

Learning Outcomes

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

1. Understanding the digital marketing concepts and its usefulness in business.

2. Planning steps for digital marketing strategy and successfully executing it.

3. Understand the importance of Social Media Platforms and Social Media Marketing for online communication.

4. Applying Search Engine Optimization techniques (SEO) and Search Engine Marketing (SEM) to maximize reach and enhance engagement of users.

Course Content

UNIT I   **8 hours**

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

UNIT II   **7 hours**

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

UNIT III   **7 hours**

Search Engine Optimization – Introduction to SEO, On-Page and Off-Page Optimization, Role of Keywords in SEO, Organic vs Non-Organic SEO, Blogging as marketing strategy, Types of Blogs.

Search Engine Marketing – Introduction to Paid marketing, Google Adwords, Types of campaigns and Campaign creation.

UNIT IV   **8 hour**

Tools for SMM and Marketing communication – Overview of Buffer, Hootsuite, Canva, Trello and Hot jar.

Web Analytics: Meaning, Purpose and process, Types, Tools for analytics – Google analytics, Audience analytics, Acquisition analytics, Behavior analytics, Conversion analytics.

Transactional Mode

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

Collaborative Learning.

Suggested Readings

● *Rajan Gupta, Supriya Madan, "Digital Marketing", BPB Publication, Ist Edition, 2022*
● *Seema Gupta, "Digital Marketing", McGraw Hill, 2nd Edition, 2018.*
● *Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson, 2nd Edition, 2020.*

Web Sources

● *https://josephscollege.ac.in/lms/Uploads/pdf/material/DigitalMarketing_Notes.pdf*
● *https://www.digitalmarketer.com/digital-marketing/assets/pdf/ultimate-guide-to-digital-marketing.p*

Semester IV

Course Title: Data Structure	L	T	P	Credits
Course Code: BIT409	4	0	0	4

Total Hours: 60

Learning Outcomes

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

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

Course Content

UNIT I   **14 hours**

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

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

UNIT II   **16 hours**

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

UNIT III   **14 hours**

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

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

UNIT IV   **16 hours**

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

Searching and Sorting**:** Searching, Types of Searching, Sorting, Types of

sorting like quick sort, bubble sort, merge sort, selection sort.

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

Transactional Mode

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

Suggested Readings

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

Web Search

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

	L	T	P	Credits
	4	0	0	4

Course Title: Discrete Mathematics
Course Code: BIT410

Total Hours: 60

Learning Outcomes

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

1. Implement the Logical and Algebraic operations.

2. Demonstrate the basic principles of relation in a set.

3. Perform operations on sets, functions, relations, and sequences.

4. Apply algorithms and use of graphs and trees as tools to simplify Problems.

Course Content

UNIT I   14 hours

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

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

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

UNIT II   16 hours

Combinations: Rule of products, permutations, combinations.

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

UNIT III   14 hours

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

UNIT IV   16 hours

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

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

Transactional Mode

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

Suggested Readings

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

Web Sources

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

	L	**T**	**P**	**Credits**

Course Title: Artificial Intelligence
Course Code: BIT411

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 Prepositionallogic.
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

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

	L	**T**	**P**	**Credits**

Course Title: Data Structures Lab
Course Code: BIT412

L	**T**	**P**	**Credits**
0	0	4	2

Total Hours: 60

Learning Outcomes

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

1. Identify the 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:60

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

Course Title: 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

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

	L	**T**	**P**	**Credits**

Course Title: Parallel Processing
Course Code: BIT415

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, Embeddings 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

- *https://www.techtarget.com/searchdatacenter/definition/parallel-processing#:~:text=Parallel%20processing%20is%20a%20method,time%20to%20run%20a%20program.*
- *https://www.javatpoint.com/parallel-processing*
- *https://www.spiceworks.com/tech/iot/articles/what-is-parallel-processing/*
- *https://www.geeksforgeeks.org/what-is-parallel-processing/*
- *https://www.techopedia.com/definition/4598/parallel-processing*
- *https://www.tutorialspoint.com/what-is-parallel-processing*

	L	**T**	**P**	**Credits**
Course Title: Big Data	**3**	**0**	**0**	**3**

Course Title: Big Data
Course Code: BIT416

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 filesystems-Java interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features - Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop

UNIT IV   **12 hours**

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

Transactional Mode

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

Suggested Readings

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

Web Sources

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

	L	**T**	**P**	**Credits**

Course Title: Digital Image Processing
Course Code: BIT417

L	**T**	**P**	**Credits**
3	**0**	**0**	**3**

Total Hours: 45

Learning Outcomes

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

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

Course Content

Unit I **11 hours**

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

Unit II **11 hours**

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

Unit III **11 hours**

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

Unit IV **12 hours**

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

Suggested Readings

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

Web Sources

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

	L	T	P	Credits
Course Title: Ethical Hacking	2	0	0	2
Course Code: BIT408				

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

- *https://www.tutorialspoint.com/ethical_hacking/index.htm*
- *https://www.javatpoint.com/ethical-hacking*
- *https://www.guru99.com/ethical-hacking-tutorials.html*

Semester V

Course Title: Programming using Java	L	T	P	Credits
Course Code: BIT509	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

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

Course Title: 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

- *https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/*
- *https://www.studytonight.com/computer-networks/reference-models-in-computer-networks*

Course Title: Programming using Java Lab
Course Code: BIT510

L	T	P	Credits
0	0	2	1

Total Hours: 30

Learning Outcomes

After completion of this course, the learner will be able to:
1. 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: Internship Training	L	T	P	Credits
Course Code: BIT511	0	0	0	6

Course Description:

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

	L	T	P	Credits
Course Title: Data Warehouse and Mining	3	0	0	3
Course Code: BIT508				

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.*
- *HumphiresH.D.(2009).Data Warehousing: Architecture and Implementation Pearson Education.*
- *AnahoryM.(2008). Data Warehousing in the Real World. Pearson Education.*

Web Sources

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

	L	T	P	Credits
Course Title: Machine Learning	**3**	**0**	**0**	**3**
Course Code: BIT512				

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

- *https://www.javatpoint.com/machine-learning-decision-tree-classification-algorithm*
- *https://data-flair.training/blogs/advantages-and-disadvantages-of-machine-learning/*
- *https://www.w3schools.com/ai/ai_perceptrons.asp*

Semester VI

Course Title: Software Engineering	L	T	P	Credits
Course Code: BIT610	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

- *https://www.simplilearn.com/tutorials/devops-*
- *https://www.geeksforgeeks.org/software-engineering-software-characteristics/*

	L	T	P	Credits
	4	0	0	4

Course Title: Computer Graphics
Course Code: BIT601

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

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

Course Title: Computer Graphics Lab	L	T	P	Credits
Course Code: BIT603	0	0	4	2

Total Hours: 60

Learning Outcomes

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

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

Course Content

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

Total Hours: 60

Learning Outcomes

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

1. Update oneself with all the latest changes in the technological world.
2. Become master in one's specialized technology.
3. 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

	L	T	P	Credits
Course Title: Service Learning	0	0	4	2
Course Code: BIT612				

Total Hours:60

Course Content

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

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

Transaction Mode

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

Suggest Reading

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

	L	T	P	Credits
	3	0	0	3

Course Title: Internet of Things
Course Code: BIT613

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:

● *Daniel Minoli, — "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications*
● *Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press*
● *https://onlinecourses.nptel.ac.in/noc17_cs22/course*
● *http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html ges.*

	L	T	P	Credits
Course Title: Introduction to Cloud Computing **Course Code: BIT614**	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 Vernbal& Non Verbal Reasoning. S. Chand.*
● *Carter, P. (2007). IQ and aptitude tests. Kogan Page Publishers.*

Web Sources

● *https://www.tutorialspoint.com/cloud_computing/cloud_computing_introduction.htm*
● *https://www.youtube.com/watch?v=Q9zvgcOrTtw*
● *https://www.forbes.com/sites/forbestechcouncil/2020/06/05/what-is-cloud-computing-a-beginners-guide/?sh=40daa0ed77d7*

- *https://www.ibm.com/cloud/learn/cloud-computing-basics*
- *https://azure.microsoft.com/en-us/overview/what-is-cloud-computing/*

	L	**T**	**P**	**Credits**

Course Title: Android Programming

Course Code: BIT608

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. Describe various components of an Android application.
2. Design user interfaces using various widgets, dialog boxes, menus.
3. Design and implement interaction among various activities/applications using intents.
4. Develop application(s) that require database handling.

Unit 1

Overview of Java programming, Android architecture, Android components including activities, view and view group, services, content providers, broadcast receivers, intents, parcels, instance state. Android development tools like Android virtual device manager, Android SDK manager, Android emulator, Android profiler, Android Debug Bridge.

Unit 2

User Interface Architecture: application context, intents: explicit intents, returning results from activities, implicit intents, intent filter, intent resolution, and applications of implicit intents, activity life cycle, activity stack, application's priority and the process' states.

Unit 3

User Interface Design: Layouts, optimizing layout hierarchies, form widgets, text fields, button control, toggle buttons, spinners, auto-complete text view, edit text, images, image buttons, menu, and dialog.

Unit 4

Database using SQLite: SQLite, Content Values and Cursors, creating SQLite databases, querying a database, adding, updating, and removing rows.

Suggested Reading:

- *Mednieks, Z. R., Dornin, L., Meike, G. B., & Nakamura, M. (2012). Programming android. " O'Reilly Media, Inc.".*
- *Horton, J. (2015). Android programming for beginners. Packt Publishing Ltd.*
- *Milette, G., & Stroud, A. (2012). Professional Android sensor programming. John Wiley & Sons*

Web Sourses:

- *https://developer.android.com/?gclid=CjwKCAjwIWkBhBTEiwA2exyO 3rDON1vmA58laLEbrZGbKPJud73QoQ7F28bO7SBC1GBCDI76cWhoCe FsQAvD_BwE&gclsrc=aw.ds*
- *https://www.geeksforgeeks.org/introduction-to-android-development/*
- *https://www.tutorialspoint.com/android/index.html*

Course Title: Data Visualization using R	L	T	P	Credits
Course Code: BIT615	3	0	0	3

Learning Outcomes   **Total Hours: 45**

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://www.javatpoint.com/r-data-visualization*
● *https://www.geeksforgeeks.org/data-visualization-in-r/*
● *https://intellipaat.com/blog/tutorial/r-programming/data-visualization-in-r/*