Vidyalankar Institute of Technology

An Autonomous Institute affiliated to University of Mumbai

Bachelor of Technology

in

Information Technology

Programme Structure

(As per NEP 2020, with effect from the Academic Year 2023-24)

Course Structure and Assessment Guidelines

for

Bachelor of Technology

in

Information Technology

Preamble

The National Education Policy (NEP) framework aims to break the mould from teacher centric to student centric educational practices. It empowers the students with flexibility in terms of choosing courses across different faculties and mode of learning.

This multidisciplinary approach will encourage learners to follow their passion and inherent interests. The learner is free to learn at a pace that he is comfortable with and this enables lifelong learning. It also enhances the scope for holistic personality development.

This premise is truly reflected in preamble of the NEP document, "The future of nation is decided in the classrooms of the schools and colleges today".

Details of implementation:

NEP curriculum framework enables us to accelerate change, redesign systems with equity in mind, respond to feedback, encourage collaboration, catch and pollinate ideas and create a culture of research and development. It will allow us to offer the required academic flexibility which will focus on improving competency level of students with diverse strengths.

The curriculum planned by VIT has vertical Program Courses consisting of core courses (PCC) of branch of engineering positioned and sequenced to achieve sequential and integral learning of the entire breadth of the specific branch. This vertical also includes Professional elective courses (PEC) which offer flexibility and diversity to learners to choose specialization from a basket of recent developments in their field of technology. The selection of unique professional elective courses based on industrial requirements and organizing them into tracks is a special feature of this curricula ensuring employability.

The vertical Multidisciplinary Courses consists of Open Elective (OE) courses and multidisciplinary minor (MD M) courses. Special vocational and skill development courses are included as a part of Skill courses vertical that make student capable to work in industrial environment.

The student is expected to demonstrate their ability through course in Experiential Learning Courses vertical like internships/On Job Training, Community Engagement Project, Real Industry Project/ research problem. Our curriculum also introduces Social Service Internship and Internship with institutes abroad along with courses like Design Thinking. This will lead to creation of products and/ or patents through this program.

For holistic development of students, apart from technical courses, Ability Enhancement Courses, Entrepreneurship/Economics/Management Courses, Indian Knowledge System and Value Education courses from vertical Humanities and Social Science and Management develop the required soft-skills and attitude amongst learners.

In Liberal Learning vertical. courses like Various Dance Forms, Global citizenship Education, Facets of Astronomy etc. aims to create balance in brain hemispheres and hence improve learners' clarity in thoughts and responses.

In addition to core courses, professional and open electives; our framework offers honor degree in each programme of engineering. It includes specialized courses along with field/ domain study that make student capable of working on industry relevant problems.

Chairman, Board of Studies
Department of Information Technology
Vidyalankar Institute of Technology

Chairman, Academic Council
Vidyalankar Institute of Technology

Second Year B. Tech. Information Technology **Preferred Semester: III**

Course Structure and Assessment Guidelines

NEP-Vertical	Course		Head of Learning	Credits	Assessment Guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
BSC	BS41	Engineering Mathematics-III	Theory	3	20	30	50	100
PC_PCC	IT04T	Microprocessor	Theory	2	15	20	40	075
	IT04P	Microprocessor Lab	Practical	1	25	-	25	050
	IT02T	Advanced Java	Theory	2	15	20	40	075
	IT02P	Advanced Java Lab	Practical	1	25	-	25	050
	IT01T	Data Structure & Analysis	Theory	2	15	20	40	075
	IT01P	Data Structure & Analysis Lab	Practical	1	25	-	25	050
CEP/FP	GESB01	Social Service Internship/ Project	Practical	3	50	-	50	100
MDM	MDXX*	Any MDM course	Theory	2	15	20	40	075
			Theory	3	As per course			100
HSSM_AEC	HS04	Presentation Skills	Practical	1	50	-	-	050
Total Credits				**21**				

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESE= End Semester Examination

*Selection based on the subset of courses made available by the Institute for the semester.

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Course Name: Engineering Mathematics-III (Discrete Mathematics)

Course Code: BS41

Category: Basic Science

Preamble:

This course introduces students to various discrete structures concepts that is helpful for understanding many fundamental topics in computer science.

Pre-requisites:

Basic Mathematics

Course Objectives:

- To introduce the concepts of Set Theory and logic
- To enable the learner to understand the concepts of Relations, Functions & Graph Theory
- To enable the learner to understand the concepts of Trees and Coding Theory

Course Outcome:

Student will be able to: -

1. Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving.
2. Apply function concepts in mathematical problems and proofs.
3. Understand the use of graph theory in programming applications.
4. Understand the concept of groups and cyclic group.
5. Understand the concept codes in Encoding-Decoding function.
6. Apply the Number Theory to different applications using theorem

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
3	-	3	-

Assessment Guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	20	30	50	100

ISA: 11 Assignment is to be given to students and best 10 is to be considered for ISA.

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No	Module name	Content	No of Hours
1	Set Theory & counting Principal	Definition and Representation of Sets, Types of sets, Operations on Sets, Laws of Set, Principle of Inclusion & Exclusion (3 sets), Partition of set, Counting Principle, Pigeonhole Principle, Mathematical Induction.	06
2	Relation and Function	Definition of Relation, Representation & Properties of Relation, Closure properties of Relation (Reflexive, Symmetric and Transitive), Partial Order and Equivalence Relation, Composite and Circular Relation, Definition of Function, Types of Function, Inverse Function, Composite Functions.	08
3	Graph Theory	Definition of Graph, Types of Graphs, Graph Representation Techniques, Sub Graphs, Operations on Graphs, Walk, Path and Circuit, Connected and Disconnected Graph, Homomorphism and Isomorphism of Graphs, Euler and Hamiltonian Graphs, Planar Graph, Cut Set, Cut Vertex.	08
4	Algebraic Structures	Algebraic structures with one binary operation, Groupoid- Closure Axiom property, Semigroup- Groupoid with Associative Property, Monoid- Semigroup with identity element property, Group- Monoid with Inverse Element Property, Abelian Group- Commutative Group, Cyclic groups- Group with Generator Element Order and subgroup, Group Homomorphism, Isomorphism and Automorphism.	08
5	Coding & Decoding theory	Coding theory: Definition of encoding function, weight, Hamming Distance, Error Detection and Correction, Group codes, with Composition Table, Minimum distance, error detection and correction, Parity Check Matrix to Encoding Function Generation, Maximum Like hood Decoding Technique to Decode give codeword using Encoding Function.	06
6	Number Theory	Modular Arithmetic, Divisibility Arithmetic, Euclid Algorithm, Prime Number Theorem, Euler's Theorem, Fermat's Little Theorems, Congruences in Number Theory, Computing Inverse in Congruences, Chinese Remainder Theorem.	09
Total			**45**

Text Books:

1. C. L. Liu, "Elements of Discrete Mathematics", TMH, ISBN 10:0-07-066913-9.
2. N. Biggs, "Discrete Mathematics", 3rd Ed, Oxford University Press, ISBN 0 –19-850717–8.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill, ISBN 978- 0-07-288008-3.
4. Cryptograph and Network Security by B. A. Forouzan & D. Mukhopadhyay, 11th edition, McGraw Hill Publication.
5. K.C. Chaudhary, A First Course in Number Theory, Asian Books Private Limited.

Reference Books:

1. Bernard Kolman, Robert C. Busby and Sharon Ross, "Discrete Mathematical Structures", Prentice-Hall of India /Pearson, ISBN: 0132078457, 9780132078450.
2. Narsingh Deo, "Graph with application to Engineering and Computer Science", Prentice Hall of India, 1990, 0 – 87692 – 145 – 4.
3. Eric Gossett, "Discrete Mathematical Structures with Proofs", Wiley India Ltd, ISBN:978-81- 265-2758-8.
4. Sriram P. And Steven S., "Computational Discrete Mathematics", Cambridge University Press, ISBN 13: 978-0-521-73311-3.
5. Elementary Number Theory and its applications by Kenneth H. Rosen, 5th edition, Addison Wesley Publication.

Course Name: Microprocessor

Course Code: IT04T

Category: Core

Preamble:
This course is an introductory course to understand the working of the microprocessor. To introduce students to assembly language programming and to explain how the peripherals are connected to the processor. This will serve as a foundation for advanced studies in Hardware design and Embedded System Design.

Pre-requisites:
Fundamentals of Computer Hardware and Networking (ES06T), Fundamentals of Logic Circuits (ES07T), Computer Organization and Architecture (ES10T)

Course Objectives:
- To develop background knowledge and core expertise in microprocessors
- To study the concepts and basic architecture of 8086 microprocessor
- To know the importance of different peripheral devices and their interfacing with 8086
- To appreciate the architecture of advanced microprocessors

Course Outcomes:
Learner will be able to:
CO1: Understand the basics of microprocessors.
CO2: Understand operating modes of 8086 microprocessor and its pipelining.
CO3: Apply concept of assembly language programming to develop simple application programs.
CO4: Analyze and understand the necessity of the peripheral chips.
CO5: Design simple microprocessor-based system with memory & I/O devices.
CO6: Appreciate and understand the advantages of advanced microprocessors.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	**ISA**	**MSE**	**ESE**	**Total**
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Introduction to 8085 Microprocessor	Evolution of INTEL microprocessors, Basic concept of 8085 architecture.	4
2	8086 Architecture and PIN configuration	8086 - Bus Interface Unit, Execution unit, Pipelined Architecture of 8086., Concept of Segmentation, Physical Address, Logical Address, 8086 – Pin description, Minimum and Maximum Mode system diagram, 8284 clock generator, 8288 bus controller.	6
3	8086 Addressing Modes & Instruction set	8086 – Addressing Modes, Instruction Set, Assembler directives and assembly language programming with 8086.	6
4	Peripheral chips	Concept of parallel peripheral interface and study of 8255 (PPI), Interrupt structure of 8086 and study of 8259 (PIC), Concept of DMA and study of 8257 (DMAC).	6
5	8086 Based System Design	Address decoders for memory interfacing, Interfacing of RAM, EPROM, and I/O chips with 8086.	4
6	Introduction of Advanced Pentium Processor Architecture	Introduction to the architecture of Pentium Processor and concept of Superscalar Architecture Comparative study of salient features of 8086, 80186,80286, 80386, 80486 and Pentium processor.	4
Total			**30**

Textbooks:

1. Douglas Hall, 'Microprocessors and Interfacing', TMH 2005
2. John Uffenbeck, '8086 Family: Design, programming and interfacing', PH, 2001
3. Barry Brey, 'The intel microprocessor 8086/8088,80186/8088,80286,80386,80486, Pentium and Pentium Pro Processor architecture, programming and interfacing', PHI1997

Course Name: Microprocessor Lab

Course Code: IT04P

Category: Core

Preamble:
A professional in any field of computing should not regard the computer as just a black box that executes programs by magic. All students of computing should acquire some understanding and appreciation of a computer system's functional components, their characteristics, their performance, and their interactions. Students need to understand the addressing modes, instruction set of a microprocessor and should be able to develop simple application programs.

Pre-requisites:
Fundamentals of Computer Hardware and Networking Lab (ES06P), Fundamentals of Logic Circuits Lab (ES07P)

Course Objectives:

- To introduce learners with instruction set of a microprocessor.
- To introduce learners with enough assembly language to enhance their knowledge on today's most widely used microcomputer family.
- To improve learners' systems programming skills through programming exercises carried out by students.
- To implement solutions to problems using the concepts the learners will take through the course.

Course Outcomes:
Learner will be able to:
CO1: Understand instruction set/format of a microprocessor.
CO2: Understand concept of assembly language programming.
CO3: Develop assembly language program for simple applications.
CO4: Apply the knowledge of DOS interrupt and its various functions.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment

methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals:

Sr No.	Title of Practicals
1	Introduction to assembler directives and assembler like TASM, MASM
2	ALP using ADD, SUB, MUL, DIV instructions
3	ALP using AND, OR, XOR instructions
4	ALP for BCD to ASCII & ASCII to BCD conversion
5	ALP for block transfer using string instructions
6	ALP for block exchange
7	ALP to find out smallest & largest of the array
8	ALP to sort the array in ascending & descending order
9	ALP using BIOS routine and DOS interrupt for keyboard interface
10	ALP using BIOS routine and DOS interrupt for display interface

Textbooks:

1. Douglas Hall, 'Microprocessors and Interfacing', TMH 2005
2. John Uffenbeck, '8086 Family: Design, programming and interfacing', PH, 2001
3. Barry Brey, 'The intel microprocessor 8086/8088,80186/8088,80286,80386,80486, Pentium and Pentium Pro Processor architecture, programming and interfacing', PHI1997

Course Name: Advanced Java

Course Code: IT02T

Category: Core

Preamble:

This course introduces advanced concepts of Java programming. It covers database connectivity, networking, servlets, Java Server Pages and Enterprise Java Beans. It demonstrates web application development and database connectivity using Java programming.

Pre-requisites:

Object Oriented Programming (ES05T)

Course Objectives:

- To introduce the advanced concepts of Java
- To enable the students, develop front end applications using Java Swing
- To provide students with an understanding of database connectivity through JDBC
- To enable the students, create simple client server application using Java networking
- To introduce server-side programming using Java Servlets and JSP
- To introduce full application development using Java Enterprise Beans

Course Outcomes:

Learner will be able to:
CO1: Design graphical interface using Swing components
CO2: Implement database connectivity using JDBC.
CO3: Implement socket programming and remote method invocation
CO4: Design and implement server side programming using servlets
CO5: learn Server- side programing and create dynamic web pages using JAVA server pages
CO6: Understand the multi-tier architecture of web based enterprise applications using enterprise java beans (EJB)

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Swings	Event Handling, JFrames, Lists, Tables, Trees, Text Components, Progress Indicators, Menu, Buttons, Combo box, Component Organizers	5
2	Java database connectivity	Design of JDBC, JDBC configuration, Executing SQL statement, Query Execution, Scrollable and updatable result sets, row sets, metadata, Transaction	5
3	Networking	Networking basics, TCP IP client sockets, URL, TCP IP sever sockets, Datagrams, Remote Method Invocation(RMI)	5
4	Introduction to Java Servlets	**Introduction to servlets**: Need for dynamic content, java servlet technology, why servlets? **Servlet API and Lifecycle**: servlet API, servletConfig interface, ServletRequest and ServletResponse Interfaces, GenericServlet Class. ServletInputStream And ServletOutputStreamClasses, RequestDispatcher Interface,HttpServlet Class, HttpServletRequest and HttpServletResponse Interfaces, HttpSession Interface, Servlet Lifecycle. **Working with servlets:** organization of a web application, creating a web application(using netbeans), creating a servlet, compiling and building the web application	5
5	Java server Pages	Introduction, disadvantages, JSP v/s Servlets, Lifecycle of JSP, Comments, JSP documents, JSP elements, Action elements, implicit objects, scope, characterquoting conventions, unified expression language.	5
6	Enterprise JAVA Bean (EJB)	Enterprise bean architecture, Benefits of enterprise bean, types of beans, Accessing beans, packaging beans, creating web applications, creating enterprise bean, creating web client, creating JSP file, building and running web application.	5
Total			**30**

Text Books:

1. Java EE 6 for Beginners, Sharanam Shah, Vaishali Shah, SPD
2. Core Java Vol. II – Advanced Features, Cay S. Horstmans, Gary Coronell, Eight Edition, Pearson

Reference Books:

1. Java Complete Reference, Herbert Schildt, Seventh Edition,TMH.

Course Name: Advanced Java Lab

Course Code: IT02P

Category: Core

Preamble:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences: Develop web and stand-alone applications using advanced concepts of Java.

Pre-requisites:

Object oriented programming Lab (ES05P)

Course Objectives:

- To develop front end applications using Java Swing and AWT
- To access database through JDBC
- To create the simple client server application using network protocols.
- To implement server-side programming using Java Servlets and JSP
- Full application development using Java Enterprise Beans

Course Outcomes:

Learner will be able to:
CO1: Develop programs using GUI Framework (AWT and Swing).
CO2: Handle events of AWT and Swings components.
CO3: Develop programs to handle events in Java Programming.
CO4: Develop Java programs using networking concepts.
CO5: Develop programs using database.
CO6: Develop programs using Servlets.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of Practical:

Sr No.	Title of Practical
1	Program to demonstrate use of components like Label, Button, Textbox, Checkbox and Radio Button
2	Design a registration form
3	Demonstrate different layouts
4	Program to create simple calculator using Grid Layout
5	Design a Paint application using MenuBar
6	Write a program to show use of URLConnection class
7	Write a program to implement chat using ServerSocket and Socket class
8	Write a program to implement chat using datagram
9	Write a program to create Session using cookies
10	Write a program to create JDBC connection. Perform CRUD operations

Reference Books:

Java Complete Reference, Herbert Schildt, Seventh Edition,TMH.

Course Name: Data Structures & Analysis

Course Code: IT01T

Category: Core

Preamble:

This course introduces students to different data structures that they have to understand, implement and use for real life problems. Starting from linear data structures like Stacks, Queues, link-lists till non-linear data structures like graph, trees.

Pre-requisites:

Structured Programming (ES04T)

Course Objectives:

- The fundamental knowledge of data structures.
- The programming knowledge which can be applied to sophisticated data structures.
- The fundamental knowledge of stacks queue, linked list etc.
- The fundamental knowledge of Trees, Graphs etc.
- The real time applications for stacks, queue, linked list, trees, graphs etc.

Course Outcomes:

Learner will be able to:
CO1: Define different types of data structures and operations.
CO2: Implement linear data structure like stack or queue with operations.
CO3: Analyze the different types of linked lists like singly, doubly, and circular with operations.
CO4: Create and manipulate different types of trees with their properties and operations.
CO5: Create and represent graphs, including vertices, edges, adjacency matrix/ list, and traversal algorithms.
CO6: Create and represent graphs, including vertices, edges, adjacency matrix/ list, and traversal algorithms.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Introduction to Data Structures	Introduction to Data Structures, Concept of ADT, Types of Data Structures-Linear and Nonlinear, Operations on Data Structures.	2
2	Stack and Queue	Introduction, ADT of Stack, Operations on Stack, Array Implementation of Stack, Applications of Stack Correctness of Parenthesis, Infix to Postfix Conversion and Postfix Evaluation, Recursion. Introduction, ADT of Queue, Operations on Queue, Array Implementation of Queue, Types of Queue Circular Queue, Priority Queue, Double Ended Queue.	7
3	Linked List	Introduction, Representation of Linked List, Linked List v/s Array, Types of Linked List - Singly Linked List, Circular Linked List, Doubly Linked List, Operations on Singly Linked List and Doubly Linked List, Stack and Queue using Singly Linked List	7
4	Trees	Introduction, Tree Terminologies, Binary Tree, Types of Binary Tree, Binary Tree Traversals, Binary Search Tree, Operations on Binary Search Tree, Applications of Binary Tree-Expression Tree, Huffman Encoding, Search Trees-AVL, rotations in AVL Tree, Introduction of B Tree, B+ Tree	7
5	Graph	Introduction, Graph Terminologies, Representation of Graph, Graph Traversals-Depth First Search (DFS) and Breadth First Search (BFS), MST using Kruskals and Prims Algorithm	5
6	Hashing	Hashing, Hash Functions, Collision resolution Techniques	2
Total			**30**

Text Books:

1. S. K Srivastava, Deepali Srivastava; Data Structures through C in Depth; BPB Publications; 2011.
2. Yedidya Langsam, Moshej Augenstein, Aaron M. Tenenbaum; Data Structure Using C & C++; Prentice Hall of India; 1996.
3. Reema Thareja; Data Structures using C; Oxford.

Reference Books:

1. C & Data Structures -Prof. P.S Deshpande, Prof. O.G Kakde, Dreamtech Publications.
2. Data Structure Using C- E. Balaguruswamy, McGraw Hill Publications.

Course Name: Data Structures & Analysis Lab

Course Code: IT01P

Category: Core

Preamble:

This course demonstrates familiarity with major algorithms and data structures and analyzes performance of algorithms. It is used to choose the appropriate data structure and algorithm design method for a specified application and determine which algorithm or data structure to use in different scenarios.

Pre-requisites:

Structured Programing lab (ES04P)

Course Objectives:

- To use data structures as the introductory foundation for computer automation to engineering problems.
- To use the basic principles of programming as applied to complex data structures.
- To learn the principles of stack, queue, linked lists and its various operations.
- To learn fundamentals of binary tree, graph, binary search tree, tree & graph traversal techniques.
- To learn the applications of linked lists, stacks, queues, trees and graphs.

Course Outcomes:

Learner will be able to:
CO1: Define different types of data structures and operations
CO2: Implement linear data structure like stack or queue with operations.
CO3: Analyze the different types of linked lists like singly, doubly, and circular with operations.
CO4: Create and manipulate different types of trees with their properties and operations.
CO5: Create and represent graphs, including vertices, edges, adjacency matrix/ list, and traversal algorithms
CO6: Apply different hashing techniques to efficiently retrieve and manipulate data.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Suggested List of practical

Learners are expected to perform practical based on the following suggested topics.

Sr. No.	Suggested Topic(s)
1	Array Implementation of Stack and Queue
2	Array implementation of circular queue
3	Array implementation of priority queue
4	Implementation of singly linked list
5	Implementation of doubly linked list
6	Implementation of circular linked list
7	Implementation of doubly circular linked list
8	Linked list implementation of stack and queue
9	Implementation of binary tree
10	Implementation of tree traversal techniques
11	Implementation of binary search tree
12	Implementation of threaded binary tree
13	Implementation of graph traversal
14	Implementation of minimum spanning tree using prim's and krukshal's algorithm
15	Implementation of shortest path using Dijkstra's algorithm
16	Implementation of infix to postfix conversion and evaluation of postfix expression
17	Implementation of sorting & searching techniques

Text Books:

1. S. K Srivastava, Deepali Srivastava; Data Structures through C in Depth; BPB Publications, 2011.
2. Yedidya Langsam, Moshej Augenstein, Aaron M. Tenenbaum; Data Structure Using C & C++; Prentice Hall of India; 1996.
3. Reema Thareja; Data Structures using C; Oxford.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni; Fundamentals of Data Structures; Galgotia Publications; 2010.
2. Jean Paul Tremblay, Paul G. Sorenson; An introduction to data structures with applications; Tata Mc Graw Hill; 1984.
3. Rajesh K. Shukla; Data Structures using C and C++; Wiley India; 2009.

Course Name: Principle of communication

Course Code: OE13

Category: Basic Science

Preamble:

This course introduces to basic working of Analog and Digital communication system. It is used to understand different analog as well as digital modulation techniques we use for transmission of signals in different applications. It helps to determine impact of noise on communication system.

Pre-requisites:

Physics (BS14P)

Course Objectives:

- To study the basic of Analog and Digital Communication Systems.
- To describe the concept of Noises in communication and its various parameters.
- To acquire the knowledge of different modulation techniques such as AM, FM and study the block diagram of transmitter and receiver.
- To study the sampling theorem and pulse Analog and digital modulation techniques.
- To learn the concept of multiplexing.
- To understand digital band pass modulation techniques.

Course Outcomes:

Learner will be able to:
CO1: Understand the basic elements of communication system.
CO2: Differentiate types of noise and its impact on communication systems.
CO3: Compare transmitter and receiver of AM, DSB, SSB and FM.
CO4: Describe Analog and digital pulse modulation systems.
CO5: Illustrate the principles of multiplexing and demultiplexing techniques.
CO6: Describe digital band pass modulation techniques.

Course Scheme:

Contact Hours		Credit Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment/evaluation guidelines for the courses of different credits are mentioned in the above table. Notwithstanding the above, each course faculty shall have the choice to decide her/his assessment methodology based on the nature of the course. Faculty may propose the revised assessment methodology for his/her course. However, the revised assessment methodology shall be approved by a panel constituted at institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Introduction to communication systems	Basic block diagram of Analog and Digital communication system. Types of communication channel. **Self-learning topics:** application areas of Analog and Digital communication.	2
2	Noise in communication system	Basics of signal representation and analyses, Types of Noise, Noise Parameters-Signal to Noise ratio, Noise factor, Noise Figure, Friss formula and equivalent noise temperature. **Self-learning topics:** Introduction to Fourier Transform and its property.	4
3	Amplitude and Angle Modulation Technique	Need for modulation, Amplitude modulation techniques, DSBFC-AM, DSBSC-AM, SSB-AM- block diagram, Spectrum, waveform, bandwidth, power calculations. Generation of AM and its different types, TRF receiver and Super heterodyne receiver and its characteristics. Angle Modulation FM: Principle of FM, Waveform, spectrum, bandwidth. FM generation: Direct method (Varactor diode), Indirect method (Armstrong method). FM demodulator-Foster Seeley Discriminator. **Self-learning topics:** Use of AM and FM in modern communication Technology.	10
4	Pulse Analog Modulation and Digital Modulation	Sampling Theorem, PAM, PWM and PPM generation and degeneration. Quantization process, Pulse code modulation, delta modulation, Adaptive delta modulation. Introduction to line codes.	7

		Self-learning topics: Line coding and ISI	
5	Multiplexing Techniques	Principle of Time Division Multiplexing, Frequency Division Multiplexing, Wavelength Division Multiplexing, Code Division Multiplexing. **Self-learning topics:** Orthogonal Frequency Division Multiplexing, Space Division Multiplexing.	3
6	Digital Band Pass Modulation Techniques	Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Q-PSK generation and detection.	4
Total			**30**

Textbooks:

1. George Kennedy and Bernard Davis, "Electronics Communication System", Tata McGraw Hill, 5th edition.
2. Simon Haykin, Michael Moher, "Introduction to Analog and Digital Communications", Wiley India Pvt. Ltd. 2nd Ed.

Reference Books:

1. Wayne Tomasi, "Electronics Communication Systems, Pearson Publication, 5th Ed.
2. B.P. Lathi, Zhi Ding "Modern Digital and Analog Communication system", Oxford University Press, Fourth edition.
3. Herbert Taub, Donald L Schilling, Goutam Saha, "Principle of communication Systems", TataMcGraw Hill, 3rd Ed.
4. K. Sam Shanmugam, "Digital and Analog Communication Systems", Wiley India Pvt. Ltd., 1st Ed.

Course Name: Chemistry

Course Code: BS19

Category: Basic Science

Preamble:

This course of Chemistry imparts the students sound knowledge on the principles of chemistry involving different application-oriented topics required in technology & engineering.

Pre-requisites:

Basic Chemistry

Course Objectives:

- The contents of this course will aid in quantification and understanding the applications of several concepts in Chemistry.
- To appreciate the need for and importance of engineering chemistry for industrial and domestic use.
- To gain knowledge on existing and future upcoming materials used in device fabrication.
- To impart knowledge of green chemical technology and its applications.
- To enhance the thinking capabilities in line with the modern trends in engineering and technology.

Course Outcome:

Student will be able to:
CO1: Interpret properties, synthesis, and uses of important materials in various engineering applications.
CO2: Apply the fundamentals of electrochemistry in prevention & control measures related to corrosion of structures and devices.
CO3: Associate Green Chemistry principles in product development knowledge.
CO4: Students will be able to perform standard computational chemistry tasks.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	75	-	-	075

Detailed Syllabus:

Module no	Module name	Content	No of Hours
1	Engineering Materials- Nanomaterials & Composite Materials	**Advanced polymeric materials:** Advanced polymeric materials: Conducting polymers- Polypyrrole, Polyaniline, polythiophene, (properties & applications), Light Emitting polymers (LEPs), Liquid crystal properties. In computers- electronics engineering materials used in computers **Nanomaterials:** Introduction, Fullerenes, Carbon nanotubes, Nanowires, Electronic and mechanical properties, Applications of nanomaterials - Catalysis, Electronics & Telecommunication, Medicines, Energy sciences. **Composite Materials:** Basics of composites, Types of Composites: Particle, Fibre, Reinforced, Structural, Real-life applications. **Smart materials:** Shape Memory Alloys, piezo-electric, chromo-active, photo active materials, etc. required in computer field Packaging materials, Package substrates, Board fabrication Solder material- lead-free fabrication, Cooling- best liquid coolant, Magnets in the laptop speakers-neodymium magnets, rare earth alloys.	8
2	Electrochemistry, Corrosion and Corrosion Control	Electrochemistry- types of electrochemical cells, Electrochemical series and Galvanic series, Numerical problems on Nernst equation Definition of corrosion, Direct chemical corrosion- Oxidation corrosion, Electrochemical corrosion and its mechanisms, Types of electrochemical corrosion- differential aeration, galvanic, stress, Intergranular, Microbial (soil) corrosion. Factors affecting corrosion (general factors), Protection of corrosion- anodic & cathodic protection, Coatings- Organic & Metallic, Applications with few practical problems of corrosion. Numerical problems based on Faraday's law Case studies like- Corrosion in electronic gadgets	9
3	Chemistry of Semiconductors	Silicon & Germanium - Physical and atomic properties, Isotopes, Chemistry and compounds, applications in industry. Study of compounds- GaAs, GaP, InP. Problems in Semiconductor industry- Shortage of semiconductors, the degradation due to corrosion, the alternative materials, reusability of the semiconductors Strengthening of semiconductors using chemical methods	6
4	Green Chemistry	Introduction to Green Chemistry, 12 Principles of Green Chemistry	3
5	Introduction to Computational chemistry	The students are expected to write and execute at least six of the following computer programs in BASIC/Fortran/C 1. Linear regression. 2. Quadratic equation. 3. Simultaneous pH titration. 4. Michaelis Menten based enzyme kinetics.	4

		5. Analysis of amino acid sequencing. 6. Analysis of DNA sequences. Complementary sequences, repeat frequencies etc. 7. Handling of atomic coordinates files and distance statistics in large molecules. 8. Determination of number of covalent and weak bonds in a given coordinate data for protein molecule. (any 2)	
		Total	**30**

Textbooks:

1. Shashi Chawla, "A Textbook of Engineering Chemistry", Dhanpat Rai & Co. (PVT.) LTD., New Delhi (2004).
2. S. S. Dara, "Engineering Chemistry", Chand & Co, New Delhi (2006)
3. Jain and Jain, "Engineering Chemistry", Dhanpat Rai & Co (PVT.) LTD, New Delhi (2006).

Reference Books:

1. B.R. Puri and L.R. Sharma, "Principles of Physical Chemistry", 45th Edition, Vishal Publishing Co. 2012.
2. Peter Atkins, "Physical Chemistry", XI th ed, Oxford, United Kingdom, Oxford University Press, 2017
3. V. K. Ahluwalia, "Green Chemistry: A textbook", Alpha Science International
4. J. D. Lee, "Concise Inorganic Chemistry"
5. V.R.Gowariker, "Polymer Science", New Age International Publication
6. S.K.Kulkarni, "Introduction to Nanotechnology"
7. C. N. Banwell, Elaine M. McCash, "Fundamentals of Molecular Spectroscopy", (4th edition), Tata McGraw Hill.
8. Y.R. Sharma, "Elementary Organic Spectroscopy", S. Chand and Co.
9. William D. Callister, "Materials Science and Engineering: An Introduction", Wiley
10. Mel Schwartz, "Smart Materials", CRC Press New York, 2009
11. Dimitris C. Lagoudas, "Shape Memory Alloys", Springer, New York, 2008
12. Micky Rakotondrabe, "Smart Materials- Based Actuators at Micro/Nano-Scale", Springer Science + Business Media, New York, 2013
13. Computer and Chemistry: introduction to programming and numerical methods T. R. Dickson, Freeman (1968)
14. Computer programs for chemistry D. F. Detar W. A. Benjamin Inc, New York Vol. 1-3 (1968-69).

Course Name: Presentation Skills

Course Code: HS04
Category: Humanities and Social Sciences (HSS)

Preamble:

The course, Presentation Skills, is intended to equip students with the necessary skill-set to help them bridge the gap from the campus to the corporate world. It will help them to be industry ready in sync with the requirements of the program they are pursuing.

Pre-requisites:
Nil

Course Objectives:

- To familiarize students about constructing a personal brand effectively.
- To create engaging and deliver effective business presentation skills by utilizing digital tools.
- To apply communication and strategic planning in business plan pitches and presentations.
- To develop an appreciation for cultural diversity and enhance intercultural communication skills.
- To understand the nuances of storyboarding and storytelling
- To present oneself professionally in interviews, group discussions and various corporate situations.

Course Outcomes:

Student will be able to:

CO1 Understand the significance of brand-building and apply strategies to construct an effective personal brand.
CO2 Demonstrate proficiency in delivering impactful presentations by utilizing digital tools and applying structured communication principles.
CO3 Proficient in crafting comprehensive business plans by employing persuasive marketing and financial strategies and implementation plans.
CO4 Craft engaging visual stories through storyboarding and storytelling, create compelling video presentations.
CO5 Demonstrate readiness for placements by gaining practice in aptitude tests, HR interviews and GDs, and crafting professional resumes.
CO6 Understand intercultural communication, global citizenship, and respect cultural diversity.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

ISA: 50 Marks (30 Marks for assignments + 20 Marks for Presentations)

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Personal Branding	Introduction to Personal Branding –Purpose, Significance, Benefits and Techniques to build a personal brand	06
		Corporate/Organisational Branding	
		Online identity of Brand on social media	
		Maintenance and Improvement of your Brand	
		Factors affecting your Brand	
2	Corporate Presentations	Business Presentation Tips	04
		Digital Presentations	
		PAIBOC Model and Minto Pyramid Principles	
3	Business Plan Presentations	Introduction to Business Plans	06
		Company Overview & Industry Analysis	
		Persuasive Communication in Marketing Strategy	
		Operations Strategy in Financial Management	
		Implementation Plan	
4	Storyboarding and Storytelling	Visual Story Telling	04
		Video Presentations	
		Story Structure with images	
		Film and Animation	
5	Placement Readiness	Mock HR Interviews	06
		Mock GDs	
		Aptitude Tests	
		Placement ready resume	
6	Global Communication	An introduction to inter-cultural communication	04
		Introduction to languages and cultures	
		Global media in mass communication	
		Tips to become a global citizen	
		Respecting cultural diversity	
Total			**30**

Guidelines to conduct practical sessions:

1. Personal Branding
2. Personal Branding
3. Personal Branding
4. Corporate Presentations
5. Corporate Presentations
6. Business Plan Presentations
7. Business Plan Presentations
8. Business Plan Presentations
9. Storyboarding and Storytelling
10. Storyboarding and Storytelling
11. Placement Readiness
12. Placement Readiness
13. Placement Readiness
14. Global Communication
15. Global Communication

List of Assignments:

1. Personal Branding (Individual)
2. Corporate Presentations (Group)
3. Business Plan Presentations (Group)
4. Storyboarding and Storytelling (Group)
5. Global Communication (Individual)

Skill Set:

1. Placement readiness and Personal branding techniques (H)
2. Corporate presentation and Business Plan techniques (M)
3. Inter-cultural communication to handle industry clients (H)

Tool Set:

1. Software for visual storytelling, film and animation
2. Software for digital presentations

Recommended Online Courses:

1. Introduction to Personal Branding - https://www.coursera.org/learn/personal-branding
2. Strategic Self-Marketing and Personal Branding - https://www.coursera.org/learn/self-marketing
3. Learn to Storyboard for Film or Animation - https://www.udemy.com/course/storyboard-for-film-or-animation/
4. Powerful Tools for Teaching and Learning: Digital Storytelling - https://www.coursera.org/learn/digital-storytelling
5. Presentation Skills: Speechwriting, Slides and Delivery Specialization - https://www.coursera.org/specializations/presentation-skills

6. Business English for Cross-Cultural Communication - https://www.coursera.org/learn/cross-cultural-communication-business

Reference Books:

1. Personal Development for Life and Work, Wallace and Masters, Thomson Learning
2. Organizational Behaviour, Robbins Stephens, Pearson Education
3. Me 2.0: 4 Steps to Building Your Future, Dan Schawbel, Diversion Books
4. Branding Pays: The Five-Step System to Reinvent Your Personal Brand, Karen Kang, Branding Pays Media.
5. The Presentation Secrets of Steve Jobs: How to Be Insanely Great in Front of Any Audience, Carmine Gallo, McGraw Hill Education
6. Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds, Carmine Gallo, St. Martin's Press
7. The Storytelling Animal: How Stories Make Us Human, Jonathan Gottschall, Mariner Books
8. Made to Stick: Why Some Ideas Survive and Others Die, Chip Heath and Dan Heath, Random House
9. The Culture Map: Decoding How People Think, Lead, and Get Things Done Across Cultures, Erin Meyer, Public Affairs
10. Kiss, Bow, or Shake Hands: The Bestselling Guide to Doing Business in More Than 60 Countries, Terri Morrison and Wayne A. Conaway, Adams Media
11. Brand Thinking and Other Noble Pursuits, Debbie Millman, Allworth
12. Building a Brand Story: Clarify Your Message So Customers Will Listen, Donald Miller, HarperCollins.

Course Name: Presentation Skills Course
Code: HS04

Category: Humanities and Social Sciences (HSS)

Preamble:

The course, Presentation Skills, is intended to equip students with the necessary skill-set to help them bridge the gap from the campus to the corporate world. It will help them to be industry ready in sync with the requirements of the program they are pursuing.

Pre-requisites:

Nil

Course Objectives:

- To familiarize students about constructing a personal brand effectively.
- To create engaging and deliver effective business presentation skills by utilizing digital tools.
- To apply communication and strategic planning in business plan pitches and presentations.
- To develop an appreciation for cultural diversity and enhance intercultural communication skills.
- To understand the nuances of storyboarding and storytelling
- To present oneself professionally in interviews, group discussions and various corporate situations.

Course Outcomes:

Student will be able to:

CO1 Understand the significance of brand-building and apply strategies to construct an effective personal brand.

CO2 Demonstrate proficiency in delivering impactful presentations by utilizing digital tools and applying structured communication principles.

CO3 Proficient in crafting comprehensive business plans by employing persuasive marketing and financial strategies and implementation plans.

CO4 Craft engaging visual stories through storyboarding and storytelling, create compelling video presentations.

CO5 Demonstrate readiness for placements by gaining practice in aptitude tests, HR interviews and GDs, and crafting professional resumes.

CO6 Understand intercultural communication, global citizenship, and respect cultural diversity.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

ISA: 50 Marks (30 Marks for assignments + 20 Marks for Presentations)

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Personal Branding	Introduction to Personal Branding –Purpose, Significance, Benefits and Techniques to build a personal brand	06
		Corporate/Organisational Branding	
		Online identity of Brand on social media	
		Maintenance and Improvement of your Brand	
		Factors affecting your Brand	
2	Corporate Presentations	Business Presentation Tips	04
		Digital Presentations	
		PAIBOC Model and Minto Pyramid Principles	
3	Business Plan Presentations	Introduction to Business Plans	06
		Company Overview & Industry Analysis	
		Persuasive Communication in Marketing Strategy	
		Operations Strategy in Financial Management	
		Implementation Plan	
4	Storyboarding and Storytelling	Visual Story Telling	04
		Video Presentations	
		Story Structure with images	
		Film and Animation	
5	Placement Readiness	Mock HR Interviews	06
		Mock GDs	
		Aptitude Tests	
		Placement ready resume	
6	Global Communication	An introduction to inter-cultural communication	04
		Introduction to languages and cultures	
		Global media in mass communication	
		Tips to become a global citizen	
		Respecting cultural diversity	
Total			**30**

Guidelines to conduct practical sessions:

16. Personal Branding
17. Personal Branding
18. Personal Branding
19. Corporate Presentations
20. Corporate Presentations
21. Business Plan Presentations
22. Business Plan Presentations

23. Business Plan Presentations
24. Storyboarding and Storytelling
25. Storyboarding and Storytelling
26. Placement Readiness
27. Placement Readiness
28. Placement Readiness
29. Global Communication
30. Global Communication

List of Assignments:

6. Personal Branding (Individual)
7. Corporate Presentations (Group)
8. Business Plan Presentations (Group)
9. Storyboarding and Storytelling (Group)
10. Global Communication (Individual)

Skill Set:

1. Placement readiness and Personal branding techniques (H)
2. Corporate presentation and Business Plan techniques (M)
3. Inter-cultural communication to handle industry clients (H)

Tool Set:

1. Software for visual storytelling, film and animation
2. Software for digital presentations

Recommended Online Courses:

7. Introduction to Personal Branding - https://www.coursera.org/learn/personal-branding
8. Strategic Self-Marketing and Personal Branding - https://www.coursera.org/learn/self-marketing
9. Learn to Storyboard for Film or Animation - https://www.udemy.com/course/storyboard-for-film-or-animation/
10. Powerful Tools for Teaching and Learning: Digital Storytelling - https://www.coursera.org/learn/digital-storytelling
11. Presentation Skills: Speechwriting, Slides and Delivery Specialization - https://www.coursera.org/specializations/presentation-skills
12. Business English for Cross-Cultural Communication - https://www.coursera.org/learn/cross-cultural-communication-business

Reference Books:

13. Personal Development for Life and Work, Wallace and Masters, Thomson Learning
14. Organizational Behaviour, Robbins Stephens, Pearson Education
15. Me 2.0: 4 Steps to Building Your Future, Dan Schawbel, Diversion Books
16. Branding Pays: The Five-Step System to Reinvent Your Personal Brand, Karen Kang, Branding Pays Media

17. The Presentation Secrets of Steve Jobs: How to Be Insanely Great in Front of Any Audience, Carmine Gallo, McGraw Hill Education
18. Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds, Carmine Gallo, St. Martin's Press
19. The Storytelling Animal: How Stories Make Us Human, Jonathan Gottschall, Mariner Books
20. Made to Stick: Why Some Ideas Survive and Others Die, Chip Heath and Dan Heath, Random House
21. The Culture Map: Decoding How People Think, Lead, and Get Things Done Across Cultures, Erin Meyer, Public Affairs
22. Kiss, Bow, or Shake Hands: The Bestselling Guide to Doing Business in More Than 60 Countries, Terri Morrison and Wayne A. Conaway, Adams Media
23. Brand Thinking and Other Noble Pursuits, Debbie Millman, Allworth
24. Building a Brand Story: Clarify Your Message So Customers Will Listen, Donald Miller, HarperCollins