Vidyalankar Institute of Technology

An Autonomous Institute affiliated to University of Mumbai

Bachelor of Technology

in

Computer Engineering

Second Year Scheme & Syllabus

(As per NEP 2020, with effect from the Academic Year 2024-25)

Preamble

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated, and taken forward in a systematic manner. Therefore, autonomy for Vidyalankar Institute of Technology is not merely a transition from pre-cooked syllabi to self-designed curriculum. Autonomy curriculum of the Institute offers required academic flexibility with emphasis on industry requirements and market trends, employability and problem-solving approach which leads to improving competency level of learners with diverse strengths. In line with this, the curriculum framework designed is **Choice Based Credit and Grading System (CBCGS)**. Number of credits for each category of courses learnt by learners, internships and projects is finalized considering the scope of study and the ability that a learner should gain through the programme. The overall credits and approach of curriculum proposed is in line with AICTE model curriculum.

The curriculum comprises courses from various categories like basic sciences, humanities and social sciences, engineering sciences, general education and branch specific courses including professional electives and open electives. The curriculum has core courses of branch of engineering positioned and sequenced to achieve sequential and integral learning of the entire breadth of the specific branch. These courses are completed by third year of the engineering programme that enables learners to prepare for higher education during their final year. Professional elective courses, that begin from third year of programme, 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 salient feature of this curricula ensuring employability. Open Elective courses cover multi-disciplinary, special skill development, project management and similar knowledge that make learner capable to work in industrial environment.
For holistic development of learners, apart from technical courses, Humanities and Social Science courses develop the required soft-skills and attitude amongst learners. Our curriculum also introduces Social Service Internship and Internship with institutes abroad along with courses like Design Thinking, Yoga and Meditation, Indian Traditional Knowledge System under General Education category. These general education courses aim to create balance in brain hemispheres and hence improve learners' clarity in thoughts and responses. In addition to this, the curriculum is augmented with Life Enrichment audit courses for knowledge inspiring experience.

Additionally, curriculum provides add-on Honours/Minor degree that involves field/ domain study. Learner can avail this degree by completing requirement of additional 15 credits.

Thus, the academic plan of VIT envisages a shift from summative to formative and competency-based learning system which will enhance learner's ability towards higher education, employability and entrepreneurship.

Chairman, Board of Studies
Department of Computer Engineering
Vidyalankar Institute of Technology

Chairman, Academic Council
Vidyalankar Institute of Technology

Second Year B. Tech. Computer Engineering **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	CE02T	Microprocessor	Theory	2	15	20	40	075
PC_PCC	CE02P	Microprocessor Lab	Practical	1	25	-	25	050
PC_PCC	CE04T	Analysis of Algorithms	Theory	2	15	20	40	075
PC_PCC	CE04P	Analysis of Algorithms Lab	Practical	1	25	-	25	050
PC_PCC	CE05T	Database Management Systems	Theory	2	15	20	40	075
PC_PCC	CE05P	Database Management Systems Lab	Practical	1	25	-	25	050
CEP/FP	GESB01	Social Service Internship/ Project	Practical	2	25	-	50	075
MDM	XX	Multidisciplinary Elective	Theory	2	15	20	40	075
HSSM_AEC	HSXX*	Any HSSM_AEC course	As per course	1	As per course			
HSSM_IKS	GEXXX*	Any HSSM_IKS course	Theory	2	25	-	50	075
Total Credits				**19**				

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.

Elective Courses (XX) under Multidisciplinary Minor

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	BS17	Biology	2	-	-	2	3
2	BS19	Chemistry	2	-	-	2	3
3	GESB07	Psychology	2	-	-	2	Any
4	GENS02	Modern Farming	2	-	-	2	Any

Elective Courses under HSSM_AEC

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	HS01T	Effective Communication	2	-	-	2	Any
2	HS01P	Effective Communication Lab	-	2	-	1	Any
3	HS03	Technical and Business Writing	1	2	-	2	Any
4	HS04	Presentation Skills	-	2	-	1	Any
5	GEA01	Voice Culture for Professional Speaking	2	-	-	2	Any
6	GESB04	Corporate and Social Etiquettes	2	-	-	2	Any

Elective Courses under HSSM_IKS

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	GEA03	Exploring Indian Art	2	-	-	2	Any
2	GESB03	Indian Traditional Knowledge System	2	-	-	2	Any
3	GEPS01	Indian Constitution	2	-	-	2	Any

Second Year B. Tech. Computer Engineering **Preferred Semester: IV**

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	BS42	Engineering Mathematics-IV	Theory	3	20	30	50	100
PC_PCC	CE06T	Computer Graphics	Theory	2	15	20	40	075
PC_PCC	CE06P	Computer Graphics Lab	Practical	1	25	-	25	050
PC_PCC	CE07T	Operating Systems	Theory	2	15	20	40	075
PC_PCC	CE07P	Operating Systems Lab	Practical	1	25	-	25	050
PC_PCC	CE09	Theory of Computer Science	Theory+ Tutorial	3	40	20	40	100
PC_PCC	CE11T	Computer Networks	Theory	2	15	20	40	075
PC_PCC	CE11P	Computer Networks Lab	Practical	1	25	-	25	050
SC_VSEC	ES10	Python Programming	Practical	2	50	-	25	075
HSSM_EEMC	GEXX/ HSXX*	Any HSSM_EEMC course	As per course	1/ 2	As per course			
HSSM_VEC	GEXX/ HSXX*	Any HSSM_VEC course	Theory	2	As per course			
Total Credits				**20/21**				

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.

Elective Courses under HSSM_EEMC

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	HS06	Principles of Economics and Management	2	-	1	3	Any
2	GECI02	Innovation and Entrepreneurship	1	-	-	1	Any
3	GEF01	Basics of Finance & Legal aspects for Business	2	-	-	2	Any
4	GEF02	Financial Management for beginners	2	-	-	2	Any

Elective Courses under HSSM_VEC

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	HS05	E-Waste and Environmental Management	2	-	-	2	Any
2	HS02T	Professional Skills	2	-	-	2	Any
3	HS02P	Professional Skills Lab	-	2	-	1	Any
4	GESB02	Universal Human Values	2	-	-	2	Any
5	GESB06	Responsibility towards sustainable environment	2	-	-	2	Any
6	GEPS02	Four Pillars of Democratic Nation	2	-	-	2	Any
7	GEWI01	Railways - Wonders of Infrastructure	2	-	-	2	Any

Detailed syllabus of Second Year Semester-III

Course Name: Engineering Mathematics-III (Discrete Mathematics)

Course Code: BS41

Category: Basic Science (BS)

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:

- Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving.
- Students will acquire a comprehensive understanding of relations and functions which play crucial roles in computer science across various domains.
- Understand the use of graph theory in programming applications.
- Understand the concept of groups and cyclic group.
- Understand the concept codes in Encoding-Decoding function.
- Apply the Number Theory to different applications using theorem

Course Outcomes:

Student will be able to:

CO1: Use the basic principles of sets and operations in sets and apply counting principles to determine probabilities

CO2: Apply relations and to determine their properties

. CO3: Interpret different traversal methods for trees and graphs. Model problems in Computer Science using graphs and trees.

CO4: Use the properties of algebraic structures

CO5: Understand the concept codes in Encoding-Decoding function.

CO6: Apply the Number Theory to different applications using theorem

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
3	0	3	0

Assessment guidelines:

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

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.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Set Theory and Counting Techniques	• 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	6
2	Relations and Functions	• 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.	8
3	Graph Theory	• Definition of Graph • Types of Graphs, Graph Representation Techniques • Sub Graphs, Operations on Graphs	8

		• Walk, Path and Circuit • Connected and Disconnected Graph • Homomorphism and Isomorphism of Graphs • Euler and Hamiltonian Graphs • Planar Graph • Cut Set, Cut Vertex	
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.	8
5	Coding and 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	6
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	9
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: CE02T

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.

Course Pre-requisite:

1. ES06T (Fundamentals of Computer Hardware and Networking)
2. ES07T (Fundamentals of Logic Circuits)

Course Objectives:

- To develop background knowledge and core expertise in Microprocessor
- 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:

After successful completion of the course students will be able to:

CO1: Understand the basics of RISC & CISC architecture and 8086 microprocessor.

CO2: Apply concept of assembly language programming to develop simple application programs.

CO3: Analyze and understand the necessity of the peripheral chips.

CO4: Design simple microprocessor-based system with memory & I/O devices.

CO5: 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	75

Detailed Syllabus:

Module No.	Module Name	Contents	Hours
1	Introduction to Microprocessor	Fundamental Units of a Computer	04
		Introduction to Buses	
		Compare RISC & CISC architecture	
		Basic concept of – Clock cycle, Machine cycle, Instruction cycle	
2	8086 Architecture and PIN configuration	8086 - Bus Interface Unit, Control unit, Programmers Model	06
		Concept of Segmentation, Physical Address, Logical Address	
		8086 – Pin description, Power on and manual Reset ckt., Minimum and Maximum Modes,	
3	8086 Addressing Modes & Instruction set	8086- Addressing Modes	06
		8086 - Instruction set	
		Assembler directives and assembly language programming with 8086	
4	Peripheral Chips	Concept of parrel peripheral interface and study of 8255 (PPI)	06
		Interrupt structure of 8086 and study of 8259 (PIC)	
		Concept of DMA and study of 8237 (DMAC)	
5	8086 Based System Design	Address decoders for memory interfacing	04
		Interfacing of RAM, EPROM, and I/O chips with 8086	
6	Advanced Microprocessors	Introduction to the architecture of Pentium Processor and concept of Superscalar Architecture	04
		Comparative study of salient features of 8086, 80186, 80286, 80386, 80486 and Pentium processor.	
		Total	**30**

Text Books:

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: CE02P

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.

Course Pre-requisite:

1. ES06P (Fundamentals of Computer Hardware and Networking Lab)
2. ES07P (Fundamentals of Logic Circuits Lab)

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 Improving learners systems programming skills through programming exercises carried out by students.
- Learners are expected to implement solutions to problems using the concepts they will take through the course.

Course Outcomes:

After successful completion of the course students 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.

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

Suggested list of Practicals:

Sr. No.	Practicals
1	Introduction to assembler directives
2	Introduction to assembler like TASM, MASM etc.
3	ALP using ADD, SUB, MUL, DIV instructions
4	ALP using AND, OR, XOR instructions
5	ALP for BCD to ASCII & ASCII to BCD conversion
6	ALP for HEX to ASCII & ASCII to HEX conversion
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 for keyboard interface
10	ALP using BIOS routine for display interface

Reference Books:

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: Analysis of Algorithms

Course Code: CE04T

Category: Core

Preamble:
The course covers the fundamental principles and techniques used in designing and analyzing algorithms. Students will learn how to analyze the performance of algorithms, measure their efficiency, and compare different algorithms based on their time and space complexity. The course is designed for students with a solid understanding of programming and data structures. By the end of the course, students will have a deep understanding of the principles of algorithm design and analysis and will be equipped with the tools and techniques necessary to develop efficient algorithms for a wide range of computational problems.

Pre-requisites:

1. BS41 (Engineering Mathematics-III)
2. CE01T (Data Structures)

Course Objectives:

- To provide a deep understanding of algorithmic design and analysis techniques that enable the development of efficient and effective algorithms for solving computational problems.
- To develop a strong foundation in the theory of algorithms, including concepts such as time and space complexity, algorithmic paradigms, data structures, graph algorithms, sorting and searching, and dynamic programming.
- To equip students with the tools and techniques necessary to compare and evaluate the performance of different algorithms and choose the best algorithm for a given problem.
- To provide students with the knowledge and skills required for a successful career in software development, data analysis, and other fields that require strong analytical and problem-solving abilities.

Course Outcomes:

Learner will be able to:
CO1: Analyze the time and space complexity of algorithms.
CO2: Apply and Analyze Divide and Conquer strategy to solve given problems.
CO3: Apply and Analyze Greedy strategy to solve given problems.
CO3: Apply and Analyze Dynamic Programming strategy to solve given problems.
CO4: Apply and Analyze Backtracking, Branch and Bound strategy to find solution for the given problems.
CO5: Classify a problem as computationally tractable or intractable and discuss strategies to address intractability.

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	75

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.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Introduction to Algorithm Analysis	Performance analysis: Space, and Time complexity, Growth of function. Asymptotic Notations: Big-Oh, Omega Theta notation. Analysis of selection sort, insertion sort and Naïve String-Matching Algorithm. Recurrences: The substitution method, Recursion tree method, Master method.	8
2	Divide and Conquer Approach	General method, Analysis of Merge sort and Quick sort, Finding minimum and maximum algorithms and their Analysis, Analysis of Binary search.	4
3	Greedy Method Approach	General Method, Analysis of Minimum cost spanning trees: Kruskal and Prim's algorithm, Single source shortest path: Analysis of Dijkstra's Algorithm, Fractional Knapsack Problem and Job Sequencing with Deadlines	6
4	Dynamic Programming Approach	General Method, Finding nth term in Fibonacci series, Single Source Shortest Path: Bellman Ford Algorithm All Pair Shortest Path: Floyd Warshall's Algorithm, Longest Common Subsequence,0/1 Knapsack Problem, Matrix Chain Multiplication and Sum of Subset Problem.	7
5	Backtracking and Branch and Bound	General Method, Backtracking: N-queen problem, Graph Coloring. Branch and Bound: 15 Puzzle problem, Travelling Salesperson Problem	3
6	Introduction to Complexity Theory	The class P and NP. Polynomial reduction. NP-Complete Problems. NP-Hard Problems	2

Total	**30**

Text Books:

1. T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", 2nd Edition, PHI Publication 2005.
2. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson Education.
3. Ellis Horowitz, Sartaj Sahni, S. Rajsekaran. "Fundamentals of computer algorithms" University Press.

Reference Books:

1. Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani, "Algorithms", Tata McGraw-Hill Edition.
2. S. K. Basu, "Design Methods and Analysis of Algorithm", PHI.

Course Name: Analysis of Algorithms Lab

Course Code: CE04P

Category: Core

Preamble:
The course covers the fundamental principles and techniques used in designing and analyzing algorithms. Students will learn how to analyze the performance of algorithms, measure their efficiency, and compare different algorithms based on their time and space complexity. The course is designed for students with a solid understanding of programming and data structures. By the end of the course, students will have a deep understanding of the principles of algorithm design and analysis and will be equipped with the tools and techniques necessary to develop efficient algorithms for a wide range of computational problems.

Pre-requisites:

- BS41 (Engineering Mathematics-III)
- CE01P (Data Structures Lab)

Course Objectives:

- To introduce the methods of designing and analyzing algorithms.
- Design and implement efficient algorithms for a specified application.
- Strengthen the ability to identify and apply suitable algorithms for the given real-world problem.
- Analyze worst-case running time of algorithms and understand fundamental algorithmic problems.

Course Outcomes:

At the end of the course, the students will be able to
CO1: Implement the algorithms using different approaches.
CO2: Analyze the complexities of various algorithms.
CO3: Apply and Analyze Greedy strategy to solve given problems.

Course Scheme:

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

Assessment Guidelines:

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

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.

Suggested List of Practical's:

Sr No.	Suggested Topic(s)
1.	Introduction: Selection sort, Insertion sort
2.	Divide and Conquer Approach: Finding Minimum and Maximum, Merge sort, Quick sort, Binary search
3.	Greedy Method Approach: Single source shortest path- Dijkstra Fractional Knapsack problem Job sequencing with deadlines Minimum cost spanning trees-Kruskal and Prim's algorithm
4.	Dynamic Programming Approach: Single source shortest path- Bellman Ford All pair shortest path- Floyd Warshall 0/1 knapsack Longest common subsequence
5.	Backtracking: N-queen problem Graph coloring

Text Books:

1. T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", 2nd Edition, PHI Publication 2005.
2. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson Education.
3. Ellis Horowitz, Sartaj Sahni, S. Rajsekaran. "Fundamentals of computer algorithms" University Press.

Reference Books:

1. Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani, "Algorithms", Tata McGraw-Hill Edition.
2. S. K. Basu, "Design Methods and Analysis of Algorithm", PHI.

Course Name: Database Management System

Course Code: CE05T

Category: Core

Preamble:

The goal of the course is to introduce the students to relational database design. This course covers the design and implementation of databases using SQL commands.

Pre-requisites:

CE01T (Data Structure)

Course Objectives:

- Develop entity relationship data model and its mapping to relational model.
- Learn relational algebra and Formulate SQL queries.
- Apply normalization techniques to normalize the database.
- Understand concept of transaction, concurrency control and recovery techniques.

Course Outcomes:

Learner will be able to:
CO1: Recognize the need of database management system.
CO2: Design ER and EER diagram for real life applications.
CO3: Construct relational model and write relational algebra queries.
CO4: Formulate SQL queries.
CO5: Apply the concept of normalization to relational database design.
CO6: Describe the concept of transaction, concurrency and recovery.

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 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.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Introduction Database Concepts	Introduction, Characteristics of databases, File system v/s Database system, Data abstraction and data Independence, DBMS system architecture, Database Administrator	2
2	Entity–Relationship Data Model	The Entity-Relationship (ER) Model: Entity types: Weak and strong entity sets, Entity sets, Types of Attributes, Keys, Relationship constraints: Cardinality and Participation, Extended Entity-Relationship (EER) Model: Generalization, Specialization and Aggregation	4
3	Relational Model and relational Algebra	Introduction to the Relational Model, relational schema and concept of keys. Mapping the ER and EER Model to the Relational Model, Relational Algebra-operators, Relational Algebra Queries.	6
4	Structured Query Language (SQL)	Overview of SQL, Data Definition Commands, Integrity constraints: key constraints, Domain Constraints, Referential integrity, check constraints, Data Manipulation commands, Data Control commands, Set and string operations, aggregate function-group by, having, Views in SQL, joins, Nested and complex queries, Triggers	6
5	Relational-Database Design	Pitfalls in Relational-Database designs, Concept of normalization, Function Dependencies, Armstrong Axioms of functional dependency, Closure set of attributes, Equivalence of Functional dependency, First Normal Form, 2NF, 3NF, BCNF	6
6	Transactions Management and Concurrency and Recovery	Transaction concept, Transaction states, ACID properties, Transaction Control Commands, Concurrent Executions, Serializability-Conflict and View, Concurrency Control: Lock-based, Timestamp-based protocols, Recovery System: Log based recovery, Deadlock handling	6
Total			**30**

Text Books:

1. Korth, Slberchatz, Sudarshan, Database System Concepts, 6thEdition, McGraw Hill
2. Elmasri and Navathe, Fundamentals of Database Systems, 5thEdition, Pearson Education
3. Raghu Ramkrishnan and Johannes Gehrke, Database Management Systems, TMH

Reference Books:

1. Peter Rob and Carlos Coronel, Database Systems Design, Implementation and Management Thomson Learning, 5thEdition.
2. Dr. P.S. Deshpande, SQL and PL/SQL for Oracle 10g, Black Book, Dream Tech Press.
3. G. K. Gupta, Database Management Systems, McGraw Hill, 2012

Course Name: Database Management System Lab

Course Code: CE05P

Category: Core

Preamble:

The goal of the course is to introduce the students to relational database design. This course covers the design and implementation of databases using SQL commands.

Pre-requisites:

CE01P (Data Structure Lab)

Course Objectives:

- To explore design and develop of relational model.
- To present SQL and procedural interfaces to SQL comprehensively
- To introduce the concepts of transactions and transaction processing

Course Outcomes:

Learner will be able to:

CO1: Design ER /EER diagram and convert it to relational model for the real world application.
CO2: Apply DDL, DML, DCL and TCL commands.
CO3: Write simple and complex queries.
CO4: Use PL / SQL Constructs.
CO5: Demonstrate the concept of concurrent transactions execution and frontend-backend connectivity.

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 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.

Suggested List of practicals

Sr. No.	Suggested Topic(s)
1	Identify the case study and detail statement of problem. Design an Entity-Relationship (ER) / Extended Entity-Relationship (EER) Model.
2	Mapping ER/EER to Relational schema model
3	Create a database using Data Definition Language (DDL) and apply integrity constraints for the specified System
4	Apply DML Commands for the specified system
5	Perform Simple queries, string manipulation operations and aggregate functions.
6	Implement various Join operations.
7	Perform Nested and Complex queries
8	Perform DCL and TCL commands
9	Implementation of Views and Triggers.
10	Demonstrate Database connectivity

Text Books:

1. Korth, Slberchatz, Sudarshan, Database System Concepts, 6thEdition, McGraw Hill
2. Elmasri and Navathe, Fundamentals of Database Systems, 5thEdition, Pearson Education
3. Raghu Ramkrishnan and Johannes Gehrke, Database Management Systems, TMH

Reference Books:

1. Peter Rob and Carlos Coronel, Database Systems Design, Implementation and Management Thomson Learning, 5thEdition.
2. Dr. P.S. Deshpande, SQL and PL/SQL for Oracle 10g, Black Book, Dream Tech Press.
3. G. K. Gupta, Database Management Systems, McGraw Hill, 2012

Detailed syllabus of Second Year Semester-IV

Course Name: Engineering Mathematics-IV

Course Code: BS42

Category: Basic Science (BS)

Preamble:

The course aims to help students understand probability, analyze probability distributions, apply statistical methods, and test hypotheses using t-tests, F-tests, and chi-square tests and to optimize the function linear and non-linear programming techniques are included.

Pre-requisites:

Basic Mathematics

Course Objectives:

- Understanding the Statistical Techniques like Probability Distribution and Correlation and Regression to solve real world problems.
- Ability to write the suitable hypothesis and apply appropriate testing procedure
- Understand the important applications of Non-parametric test.
- To understand the concept of linear and Non-linear programming problem to optimize the function.

Course Outcomes:

Student will be able to:

CO1: Use statistical methods to analyze and interpret data sets.
CO2: Analyze the behaviour of discrete and continuous probability distributions.
CO3: Apply the statistics for testing the significance of the given large and small sample data
CO4: Use the non-parametric test for testing of Hypothesis
CO5: Apply LPP technique to optimize the functions
CO6: Apply various techniques of Operation research to solve Non-Linear Programming Problems

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

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.

Detailed Syllabus:

Module No.	Module Name	Content	No. of Hours
1	Statistical techniques	Correlation: Covariance, Karl Pearson's Correlation Coefficient. Spearman's rank correlation coefficient, Regression lines, fitting of first- and second-degree curves	8
2	Probability Distribution	Random Variable: Probability distribution for discrete and continuous random variable, Bayes Theorem (without proof) Expectation, Variance, Probability distributions: Poisson and Normal distributions.	8
3	Testing of Hypothesis	Formation of Hypothesis, Test of significance: Test of significance for Small samples: t- Test for single mean, difference of means	6
4	Non-parametric test and Anova	Chi-square test for goodness of fit and independence of attributes, F- test for ratio of variances, Analysis of Variance (One Way ANOVA)	7
5	Linear Programming	Simplex method, Big-M method (Method of penalty) Duality, Dual of LPP and Dual simplex method	8
6	Non-linear programmi ng	NLPP with one equality constraint (two or three variables) using the method of Lagrange's multipliers, NLPP with two equality constraints, NLPP with inequality constraint: Karush-Kuhn-Tucker conditions (KKT)	8
Total			**45**

Text Books:

1. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India.
2. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.
3 S. C. Gupta and V. K. Kapoor , "Fundamentals of Statistics"
4 J. K. Sharma , "Operations Research: Theory and Applications" Macmillan Publishers India, 1997.

Reference Books:

1. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India
2. D. C. Montgomery and G. C. Runger, Applied Statistics and Probability for Engineers, Wiley.
3. J. L. Devore, Probability and Statistics for Engineering and the Sciences, Cengage Learning.
4. Operations Research: Theory and Applications" by S.D. Sharma and Kedar Nath Ram Nath. Singiresu S.Rao, Engineering Optimization, New Age International.

Course Name: Computer Graphics

Course Code: CE06T

Category: Core

Preamble:
The goal of the course is to introduce students to the technical concepts behind creating synthetic computer-generated images, focusing on underlying mathematical concepts covering geometrical and attribute related features. This course attempts to uncover various 2D and 3D rendering techniques.

Pre-requisites:
Data Structure- CE01T
Structured Programming Approach- ES04T

Course Objectives:

- To enable learners to understand the basics of computer graphics, including the principles of image representation, display technology, and color models.
- To enable learner to understand 2D and 3D geometric transformations, including translation, scaling, rotation, orthographic and perspective projection.
- To enable learners to design and implement graphical user interfaces (GUIs) for software applications.

Course Outcomes:

Learner will be able to:
CO1: Understand the basic concepts of Computer Graphics.
CO2: Demonstrate various algorithms for scan conversion, for filling of basic geometrical objects and their comparative analysis.
CO3: Apply geometric transformations, viewing and clipping on graphical objects.
CO4: Explore 3-D geometric transformations, curve representation techniques and projections methods.
CO5: Understand visible surface detection techniques and illumination models.

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 and Overview of Graphics System.	Definition and Representative uses of Computer Graphics, Classification of application areas, Overview of Coordinate Systems, Definition of Scan Conversion, Rasterization and Rendering. Raster Scan & Random Scan Displays, Architecture of Raster Graphics System with display processor, Architecture of Random Scan Systems.	2
2	Raster Algorithms.	Scan Conversions of Point, Line, and Circle: DDA Algorithm and Bresenham Algorithm for Line Drawing, Midpoint Algorithm for Circle. Aliasing, Antialiasing Techniques like Pre and Post Filtering, Super Sampling, and Pixel Phasing. Filled Area Primitives: Scanline Polygon Fill Algorithm, Inside Outside Tests, Boundary Fill and Flood fill Algorithm.	8
3	Two Dimensional Geometric Transformations, Viewing and Clipping.	• Basic transformations: Translation, Scaling, Rotation. Matrix Representation and Homogeneous Coordinates, Composite Transformation. • Viewing Transformation Pipeline and Window to Viewport Coordinate Transformation. Clipping Operations: Point Clipping, Line Clipping Algorithms: Cohen–Sutherland, Midpoint Subdivision, Liang–Barsky, Polygon Clipping Algorithms: Sutherland–Hodgeman and Weiler – Atherton Algorithm.	8
4	Three-Dimensional Object Representations, Geometric Transformations and 3D Viewing.	Boundary Representation and Space Partitioning Representation: Polygon Surfaces, Bezier Curve B-Spline Curve, Fractal-Geometry: Fractal Dimension, Koch Curve. 3D-Transformations: Translation, Rotation, Scaling and Reflection. Composite Transformations: Rotation about an Arbitrary Axis.	6

		3D-Transformation Pipeline Projections– Parallel and Perspective Projection. (Matrix Representation).	
5	Visible Surface Detection.	Classification of Visible Surface Detection Algorithm, Back Surface Detection Method: Depth Buffer Method, Scan Line Method, Area Subdivision Method.	4
6	Illumination Models and Surface Rendering	Basic Illumination Models: Diffused reflection, Phong Specular Reflection Model, Halftone and Dithering Techniques, Polygon Rendering: Constant shading, Gouraud Shading, Phong Shading.	2
Total			**30**

Textbooks:

1. "Computer Graphics C version" by Hearn & Baker, 2nd Edition, Pearson Publication, ISBN-13: 978-8177587654.
2. "Computer Graphics Principles and Practice in C", by James D. Foley, Andries van Dam, Steven K Feiner, John F. Hughes, 2nd Edition, Pearson Publication, ISBN-0201121107, ISBN-9780201121100.
3. "Computer Graphics", by Samit Bhattacharya, Oxford Publication. ISBN: 9780198096191.
4. "Computer Graphics", by Rajesh K. Maurya, Wiley India Publication, ISBN-13:978-81-265-3100, ISBN:81-265-3100-2

Reference Books:

1. "Procedural Elements for Computer Graphics " by D. Rogers , Tata McGraw-Hill Publications.
2. "Computer Graphics", by Zhigang Xiang , Roy Plastock , Schaum's Outlines McGraw-Hill Education.
3. "Computer Graphics using OpenGL , by F.S.Hill , Jr. ,Third edition, Pearson Publications.

Course Name: Computer Graphics Lab

Course Code: CE06P

Category: Core

Preamble:

The goal of the course is to introduce students to the technical concepts behind creating synthetic computer-generated images, focusing on underlying mathematical concepts covering geometrical and attribute related features. This course attempts to uncover various 2D and 3D rendering techniques.

Pre-requisites:

Data Structure Lab-CE01P
SPA Lab-ES04P

Course Objectives:

- To enable learner to develop practical experience with raster algorithms for line, circle drawing and creating/ manipulating images.
- To enable learners to apply 2D & 3D geometric transformations to create visual effects and animations.
- To enable learners to use viewing transformations to define a camera position and orientation. Also implement clipping algorithms to remove parts of an image that are outside the view.

Course Outcomes:

Learner will be able to:
CO1: Understand various algorithms to draw lines in computer graphics applications, display lines with varying thickness and styles.
CO2: Understand and implement various area fill algorithms to efficiently fill areas with colors or patterns in computer graphics applications.
CO3: Apply 2D & 3D geometric transformations and clipping operations on an object to create visual effects and animations.
CO4: Understand Open GL library functions to generate graphical objects and create animated sequences in graphics applications.

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.	Suggested Topic(s)
1.	Implement DDA Line Drawing algorithms and Bresenham algorithm.
2.	Program to display thick line, dotted line, and dashed line.
3.	Line generation using parallelism approach.
4.	Implement midpoint Circle algorithm.
5.	Implement Area Filling Algorithm: Boundary Fill, Flood Fill, Scan line Polygon Fill
6.	Implement Curve: Bezier for n control points, B Spline (Uniform)
7.	Implement Fractal (Koch Curve).
8.	Character Generation: Bit Map method and Stroke Method
9.	Implement 2D Transformations: Translation, Scaling, Rotation, Reflection, Shear.
10.	Implement Line Clipping Algorithm: Cohen Sutherland / Liang Barsky.
11.	Implement polygon clipping algorithm.
12.	Program to represent a 3D object using polygon surfaces and then perform 3D transformation.
13.	Program to perform projection of a 3D object on Projection Plane: Parallel and Perspective.
14.	Study of Open GL library functions and using it to generate graphical objects.
15.	Program to perform surface rendering using Open GL functions.
16.	Program to generate an animated sequence.

Textbooks:

1. “Computer Graphics C version” by Hearn & Baker, 2nd Edition, Pearson Publication, ISBN-13: 978-8177587654.
2. “Computer Graphics Principles and Practice in C”, by James D. Foley, Andries van Dam, Steven K Feiner, John F. Hughes, 2nd Edition, Pearson Publication, ISBN-0201121107, ISBN-9780201121100.
3. “Computer Graphics”, by Samit Bhattacharya, Oxford Publication. ISBN: 9780198096191.
4. “Computer Graphics”, by Rajesh K. Maurya, Wiley India Publication, ISBN-13:978-81-265-3100, ISBN:81-265-3100-2

Reference Books:

1. “Procedural Elements for Computer Graphics ” by D. Rogers , Tata McGraw-Hill Publications.
2. “Computer Graphics”, by Zhigang Xiang , Roy Plastock , Schaum’s Outlines McGraw-Hill Education.
3. “Computer Graphics using OpenGL , by F.S.Hill , Jr. ,Third edition, Pearson Publications.

Course Name: Operating System

Course Code: CE07T

Category: Core

Preamble:

The goal of the course is to introduce the students to modern operating systems design. This course covers the design and implementation of operating systems with a focus on modern, concurrent kernels.

Pre-requisites:

CE01T (Data Structure)

Course Objectives:

- To enable learner to understand how operating system manages allocation and deallocation of different resources needed by user/ application.
- To enable learner to understand how operating system controls access to various resources and provides security.
- To enable learner to evaluate performance of different approaches used by operating systems, for effective resource utilization.

Course Outcomes:

Learner will be able to:
CO1: Understand the benefits of software modularity and how it applies to OS design.
CO2: Compare various OS scheduling policies based on performance parameters.
CO3: Analyze methods to achieve synchronization and handle deadlocks.
CO4: Evaluate performance of Memory allocation and replacement policies.
CO5: Compare various files and I/O management techniques.
CO6: Understand how principles of general OS are applied in Linux OS.

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 Operating System	Operating System definitions, Processes and Interrupts, Functions of Operating System, Operating System Structures, User mode and kernel mode of a process, Types of Operating System, System Calls, Booting	4
2	Process Management and Synchronization	Process Management: Definition of Process, Process Control Block, Process Scheduling: Types and scheduling algorithms (FCFS, SJF, SRTN, Priority, RR), Threads: Definition and Concept of Multithreading. Process Synchronization: Principles of Concurrency, Inter-process communication, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Producer and Consumer problem,	6
3	Deadlock	Principles of Deadlock: Conditions and Resource, Allocation Graphs, Deadlock Prevention, Deadlock Avoidance: Banker's Algorithm, Deadlock Detection and Recovery, Dining Philosophers Problem.	6
4	Memory Management	Memory Management Requirements, Memory Partitioning: Fixed, Partitioning, Dynamic Partitioning, Memory Allocation Strategies: Best-Fit, First Fit, Worst Fit, Paging and Segmentation, TLB, Page table design Virtual Memory: Demand Paging, Page Replacement Strategies: FIFO, Optimal, LRU, Thrashing, Kernel Memory Allocation	6
5	File Systems and I/O Management	Files and File Systems, Directory Systems, File allocation methods: Contiguous allocation, Linked allocation, Indexed allocation, Kernel I/O subsystem, Communication and Data Transfer with I/O Devices, Disk Organization, I/O Management and Disk Scheduling: FCFS, SSTF, SCAN, CSCAN, LOOK, C-LOOK, RAID Structure	5
6	The Linux System	Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Network Structure, Security	3
Total			**30**

Textbooks:

1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8thEdition, 2014, ISBN-10: 0133805913 • ISBN-13: 9780133805918
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley &Sons, Inc., 9thEdition, 2016, ISBN 978-81-265-5427-0
3. Andrew Tannenbaum, Operating System Design and Implementation, Pearson, 3rdEdition.

Reference Books:

1. Sumitabha Das, "UNIX: Concepts and Applications", McGraw Hill, 4thEdition
2. Achyut Godbole and Atul Kahate, Operating Systems, McGraw Hill Education, 3rdEdition

Course Name: Operating System Lab

Course Code: CE07P

Category: Core

Preamble:

The course introduces learners to Linux shell commands and simulate various algorithms used by general OS for managing resources. This courses project will explore the key operating system facilities in the relative isolation of an OS development framework with the goal of maximizing experiential learning.

Pre-requisites:

CE01P (Data Structure Lab)

Course Objectives:

- To enable learner to visualize the working of operating system by simulating techniques used by it to manage resources.
- To enable learner to apply techniques of process synchronization in multithreaded programs and hence develop concurrent applications.

Course Outcomes:

Learner will be able to:
CO1: Understand various shell commands of Linux OS.
CO2: Compare performance of different process scheduling policies.
CO3: Perform process/ thread synchronization for consistency and concurrency.
CO4: Simulate OS techniques for memory and virtual memory management.
CO5: Develop project to explore key OS facilities.

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.	Suggested Topic(s)
1.	Linux commands
2.	Non-Preemptive process Scheduling
3.	Preemptive process Scheduling
4.	Process synchronization using mutex locks.
5.	Deadlock Handling
6.	Dynamic memory allocation techniques
7.	Adddress translation in virtual memory
8.	Page replacement policies
9.	Disk scheduling techniques

Textbooks:

2. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8thEdition, 2014, ISBN-10: 0133805913 • ISBN-13: 9780133805918
3. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley &Sons, Inc., 9thEdition, 2016, ISBN 978-81-265-5427-0
4. Andrew Tannenbaum, Operating System Design and Implementation, Pearson, 3rdEdition.

Reference Books:

2. Sumitabha Das, "UNIX: Concepts and Applications", McGraw Hill, 4thEdition
2. Achyut Godbole and Atul Kahate, Operating Systems, McGraw Hill Education, 3rdEdition

Course Name: Theory of Computer Science

Course Code: CE09

Category: Core

Preamble:

This course introduces students to formal language and automata theory. It covers different types of grammars and automata of different powers that are required to recognize languages defined by the grammars.

Pre-requisites:

BS41 (Engineering Mathematics-III)

Course Objectives:

- Acquire conceptual understanding of fundamentals of grammars and languages.
- Build concepts of theoretical design of deterministic and non-deterministic finite automata and push down automata.
- Develop understanding of different types of Turing machines and applications.

Course Outcomes:

Learner will be able to:
CO1: Express rules in mathematical form (grammar).
CO2: Classify the problem into appropriate type of grammar.
CO3: Apply equivalence theory to recognize power of different automata.
CO4: Design Automata to meet the required specifications.
CO5: Create a tool that designs automata for a given grammar.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Tutorial	Theory	Tutorial
2	1	2	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory + Tutorial	40	20	40	100

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 Language and Automata	Concepts: Symbol, Alphabet, Language and Grammar. Types of Grammar and Automata.	2
2	Finite Automata	Deterministic: 5-tuple representation of DFA. Designing DFA for Regular Language. Minimization of DFA. Non-Deterministic: 5-tuple representation of NFA with epsilon moves and NFA without epsilon moves. Equivalence of language recognized by NFA and DFA	6
3	Regular Language and grammar	Regular Expression and Regular Grammar. Equivalence of FA and Regular Expression. Properties of Regular Sets/ Languages. Classifying language as Regular and Non-regular.	6
4	Context Free and Sensitive Languages.	Concepts: CFG, CFL, Derivations and Ambiguity. CFL as a superset of Regular. Normal Forms (CNF and GNF). Properties of CFL.	6
5	Push-down Automata	7-tuple Deterministic PDA. Deterministic and Non-Deterministic PDA. Equivalence of NPDA and CFL.	4
6	Turing Machine	Basic 7-tuple Turing Machine (TM). Variants of TM. TM as acceptor of Recursively Enumerable (RE) Languages. Halting Problem. Recursive and RE Languages. Undecidability	6
Total			**30**

Suggestion for list of Tutorials:

1. At-least one tutorial on each module. Recommended to add additional tutorials for module 3, 5 and

7.

2. Questions should be short and conceptual only. Each tutorial should be designed worth 2 Marks. Required to be solvable in 5 to 10 mins.
3. Tutorial to have major questions mapping to level 1 of Blooms Taxonomy (Understanding) and few questions mapping to level 2 of Blooms Taxonomy (Applying)

Reference Books:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman. Introduction to Automata Theory, Languages and Computation. Pearson Education. 2008.
2. Michael Sipser. Introduction to the Theory of Computation. Thomson Course Technology. 2012.
3. Peter Linz. An Introduction to Formal Languages and Automata. Jones and Bartlett Student Edition. 2016.

Course Name: Computer Network

Course Code: CE11T

Category: Core

Preamble:

This course aims to give students an overview of the concepts and fundamentals of computer networks. It covers protocol layering, enabling students to analyze network performance. Additionally, the course provides insights into the functions of the OSI and TCP/IP models and various routing protocols.

Pre-requisites:

Fundamentals of Computer Hardware and Networking (ES06T) and Analysis of Algorithm (CE04T)

Course Objectives:

- To introduce concepts and fundamentals of data communication and computer networks.
- To explore the inter-working of various layers of OSI.
- To explore the issues and challenges of protocols design while delving into TCP/IP protocol suite.
- To assess the strengths and weaknesses of various routing algorithms.
- To understand various transport layer and application layer protocols.

Course Outcomes:

Learner will be able to:
CO1: Demonstrate the concepts of data communication and compare ISO - OSI model with TCP/IP model.
CO2: Explore different design issues at data link layer.
CO3: Design the network using IP addressing and subnetting / super netting schemes.
CO4: Analyse various routing algorithms and protocols at network layer.
CO5: Analyse transport layer protocols and congestion control algorithms.
CO6: Explore protocols at application layer.

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 Computer Networks	Introduction to computer network, network application, (Interconnection networking devices), Network topology, protocol hierarchies, design issues for the layers, connection oriented and connectionless services. Revisiting OSI Model & TCP/IP Model.	4
2	Data Link Layer	Data Link Layer 2.1 DLL Design Issues (Services, Framing, Error Control, Flow Control), Error Detection and Correction(Hamming Code, CRC, Checksum) , Elementary Data Link protocols , Stop and Wait, Sliding Window(Go Back N, Selective Repeat), HDLC 2.2 Medium Access Control sublayer Channel Allocation problem, Multiple access Protocol(Aloha, Carrier Sense Multiple Access (CSMA/CD), Local Area Networks - Ethernet (802.3)	8
3	IP Addressing & Network Layer	IPv4 Addressing (classfull and classless), Subnetting, Supernetting design problems, IPv4 Protocol, Network Address Translation (NAT). IPv6 Addressing, Transition from IPV4 to IPV6	8
4	Routing Protocols	Shortest Path (Dijkastra's), Link state routing, Distance Vector Routing	4
5	Transport Layer	Connection management (Handshake), UDP, TCP, TCP state transition, TCP timers. TCP Flow control (sliding Window), TCP Congestion Control: Slow Start.	4
6	Application Layer	Protocols: DNS, HTTP, SMTP, Telnet, FTP, DHCP	2

Total	30

Textbooks:

1. Behrouz A. Forouzan, Forouzan Mosharrat , Computer Networks A Top down Approach, Mc Graw Hill education.
2. Andrew S Tanenbaum, Computer Networks -, 4th Edition, Pearson Education.

Reference Books:

1. Keshav, An Engineering Approach to Computer Networks, 2nd Edition, Pearson Education.
2. B. A. Forouzan, "TCP/IP Protocol Suite", Tata McGraw Hill edition, Third Edition.

Course Name: Computer Networks Lab

Course Code: CE11P

Category: Core

Preamble:

This course is to provide students with an overview of the concepts and fundamentals of computer networks.

Pre-requisites:

Fundamentals of Computer Hardware and Networking Lab **(**ES06P) and Analysis of Algorithms Lab (CE04P)

Course Objectives:

- To practically explore OSI layers and understand the usage of simulation tools.
- To analyze, specify and design the topological and routing strategies for an IP based networking infrastructure.
- To identify the various issues of a packet transfer from source to destination, and how they are resolved by the various existing protocols.

Course Outcomes:

Learner will be able to:
CO1: Execute and evaluate network administration commands and demonstrate their use in different network scenario
CO2: Demonstrate the installation and configuration of network simulator.
CO3: Demonstrate and measure different network scenarios and their performance behavior. CO4: Implement the socket programming for client server architecture.
CO5: Analyze the traffic flow of different protocols
CO6: Design a network for an organization using a network design tool

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

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

Sr No	Suggested Topic(s)
1	Study, understand and perform various networking commands: Ping, Tracert, trace route, ipconfig, ifconfig, nslookup, netstat
2	Designing Network Layout
3	Program for Error Detection
4	Program for Error Correction
5	Program on IP Addressing
6	Case study on Subnetting and Supernetting
7	Socket Programming
8	Chat Application
9	Installation and configuration of Wireshark tool Study the packet transmission using Wireshark and understand/visualize the IP protocol
10	Cisco Packet Tracer

Textbooks:

1. Behrouz A. Forouzan, Forouzan Mosharrat , Computer Networks A Top down Approach, Mc Graw Hill education.
2. Andrew S Tanenbaum, Computer Networks -, 4th Edition, Pearson Education.

Reference Books:

1. Keshav, An Engineering Approach to Computer Networks, 2nd Edition, Pearson Education.
2. B. A. Forouzan, “TCP/IP Protocol Suite”, Tata McGraw Hill edition, Third Edition.

Course Name: Python Programming

Course Code: ES10

Category: SC_VSEC

Preamble:

This course is designed to take students from beginner to advanced Python programming. It covers the fundamentals of Python programming, as well as advanced topics such as object-oriented programming, multithreading, web development and data analysis. Students will gain practical experience through hands-on programming assignments and projects.

Pre-requisites:

- Basic knowledge of Python programming
- Understanding of basic concepts in databases
- Familiarity with HTML, CSS, and JavaScript for web development

Course Objectives:

- To enable learner to understand variables, data types, control structure, functions, file handling in python.
- To enable learners to write programs using object-oriented programming concepts in Python.
- To enable learners to understand the use of different python libraries in data analysis.
- To enable learners to create web applications using python web framework.

Course Outcomes:

Learner will be able to:
CO1: Understand the variables, data types, control structure, functions and modules in Python.
CO2: Understand and implement the data structure of python such as List, Tuple, String, Dictionary Set.
CO3: Understand and apply object-oriented programming concepts in Python to write programs.
CO4: Perform CRUD operations on databases and understand File handling in Python.
CO5: Perform data analysis and visualization using Python libraries such as NumPy, Pandas, and Matplotlib.
CO6: Understand Multithreading and Explore python web framework for developing python-based web application.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	4	-	2

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	50	-	25	075

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Introduction to Python Programming	Overview of Python programming. Basic syntax, data types, and control structures in Python. Function and Modules in Python. Date and Time modules.	8
2	Data Structures in Python	Lists, Tuples, String, Dictionaries, Sets Implementing Stack & Queue using Python data structures. List comprehension in python.	12
3	Object-Oriented Programming (OOP) in Python	Class and object creation. inheritance, and polymorphism, absract class. Exception handling in python.	12
4	File Handling, GUI Programming and database connectivity.	Reading and writing files in Python. Desing GUI using Tkinter library. Connecting to databases using Python. Performing CRUD operations on databases using Python.	10
5	Data Analysis and Visualization using Python	Introduction to Python libraries for data analysis and visualization Using NumPy, Pandas, and Matplotlib for data analysis and visualization	8
6	Multi-Threading & Web Development in Python	Introduction to multi-threading in Python. Creating threads and managing threads. Introduction to Python Webframework.	10
Total			**60**

Textbooks:

1. Core Python Programming, Dr. R. Nageswara Rao, Dreamtech Press.
2. Beginning Python: Using Python 2.6 and Python 3.1, James Payne Wrox Publication.
3. Introduction to computing and problem solving using python , E Balagurusamy,McGraw Hill Education.

Reference Books:

1. Learn Python the Hard Way, Zed A. Shaw, Pearson Education.
2. Learn Python the Hard Way: (3rd Edition) (Zed Shaw's Hard Way Series).
3. Eric Matthes, "Python Crash Course, A Hands – on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.

4. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

Suggested List of Practical's:

Sr No.	Suggested Topic(s)
1.	Programs to explore basics of python likes input output statements, conditional & control statements.
2.	Programs to understand function, module in python.
3.	Programs to use python data structure- List, Tuple, String, Dictionary & Set.
4.	Programs to implement stack & Queue data structure.
5.	Programs to use list comprehension in python.
6.	Programs to create classes and object in python.
7.	Programs to implements inheritance, and polymorphism, absract class concepts in python.
8.	Programs to demonstrate exception handling.
9.	Programs to understand file handling in python.
10	Creating GUI with python containing widgets such as labels, textbox,radio,checkboxes and custom dialog boxes.
11	Program to demonstrate CRUD(create, read, update and delete) operations on database (SQLite/MySQL) using python.
12	Program to demonstrate use of NumPy: Array objects.
13	Program to demonstrate Data Series and Data Frames using Pandas.
14	Programs on Threading using python.
15	Program on simple socket for basic information exchange between server and client.
16	Program on Web application using python framework.

Detailed syllabus of courses from other baskets

Course Name: Chemistry

Course Code: BS19

Category: MDM

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:

Nil

Course Objectives:

- The contents of this course will aid in quantification and understand 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 Outcomes:

Learner will be able:
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	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	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	10

Module No.	Module Name	Content	No of Hours
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	8
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	5
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.	4
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: Biology

Course Code: BS17

Category: MDM

Preamble:

This course introduces students to virology and its related terms and concepts. It also introduces basic concepts of the nervous system, biological immune system, and computational neuroscience. This course will help the learners understand the mathematical models that are inspired from the corresponding biological models/processes and are extensively used in machine learning, deep learning, artificial immune system, computer security, artificial intelligence, etc.

Pre-requisites:

Nil

Course Objectives:

- Enable the learner to understand the concepts of virology.
- Enable the learner to understand the structure and functioning of the nervous system.
- Enable the learner to understand basics of natural immune systems.
- Enable the learner to understand basics of computational neuroscience.
- Enable the learner to understand the derivation of mathematical models from their biological counterparts.

Course Outcomes:

Learner will be able:

CO1: To develop an understanding of virology.

CO2: To understand the structure and functioning of biological nervous system.

CO3: To understand Principles of natural immune system.

CO4: To understand working principles of biological neural system.

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	Virology	Virus structure and morphology. Viruses of veterinary importance. Important virus families, their replication strategies, pathogenicity and transmission of viruses. Plant viruses, plant virus propagation. Bacteriophages, bacteriophage propagation viroids	5
2	Nervous System	Neuron structure, anatomy in vertebrates: central & peripheral Nervous systems, Functions of the Nervous system: Neurons & Synapses, Neural circuits and systems, Reflexes & other stimulus response circuits, Intrinsic pattern generation	5
3	Immunology	Introduction and history; Components of Immune system: Innate & Adaptive. Primary and secondary organs of the immune system, Cells of the immune system	5
4	Computational Neuroscience-I Single Neuron Modeling	Ion flux in membranes, Nernst Planck Equation, Ion-Channels, Excitable membranes, Spiking, Hodgkin Huxley models, Integrate and Fire Neurons	5
5	Computational Neuroscience-II Neural Encoding and Decoding	Spike train statistics, Receptive fields, Linear and Nonlinear models of Receptive fields, Applications of Information Theory in neural coding and decoding	5
6	Computational Neuroscience-III Plasticity: Adaptation and Learning	Synapses: structure and function, plasticity, Spike Timing Dependent Plasticity (STDP), Learning rules, Supervised and Unsupervised Learning, Classical conditioning, Reinforcement Learning.	5

Total	**30**

Textbooks:

1. Fields Virology Vol 1 and 2. B.N. Fields, D.M. Knipe, P.M. Howley, R.M. Chanock, J.L. Melnick, T.P. Monath, B. Roizman, and S.E. Straus, eds.), 3rd Edition. Lippincott-Raven, Philadelphia, PA.
2. Principles of anatomy & physiology, Tortora & G.J.Derricson, J. Willey publication (15^{th} edition)
3. Dayan, Peter, and L. F. Abbott.Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems. Cambridge, MA: MIT Press, 2001. ISBN: 9780262041997.

Reference Books:

1. Principles of Virology: Molecular Biology, Pathogenesis, and Control of Animal Viruses. S. J. Flint, V. R. Racaniello, L. W. Enquist, V. R. Rancaniello, A. M. Skalka. Latest edition / Pub. Date: December 2003 Publisher: American Society Microbiology--- Chapters 3-13.
2. Nervous system, Columbia Encyclopedia. Columbia University Press

Course Name: Presentation Skills

Course Code: HS04

Category: HSSM_AEC

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:

Learner 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	50	-	-	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.

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. Corporate/Organisational Branding. Online identity of Brand on social media. Maintenance and Improvement of your Brand Factors affecting your Brand	6
2	Corporate Presentations	Business Presentation Tips Digital Presentations PAIBOC Model and Minto Pyramid Principles	4
3	Business Plan Presentations	Introduction to Business Plans Company Overview & Industry Analysis Persuasive Communication in Marketing Strategy Operations Strategy in Financial Management Implementation Plan	6
4	Storyboarding and Storytelling	Visual Story Telling Video Presentations Story Structure with images Film and Animation	4
5	Placement Readiness	Mock HR Interviews Mock GDs Aptitude Tests Placement ready resume	6

6	Global Communication	An introduction to inter-cultural communication Introduction to languages and cultures Global media in mass communication Tips to become a global citizen Respecting cultural diversity	4
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)

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
    Building a Brand Story: Clarify Your Message So Customers Will Listen, Donald Miller, HarperCollins