

Semester - III									
Course Code	Course Name	Course Abbr	Teaching Contact Hours			Credits			
			Theory	Tutorial	Practical	Theory	Tutorial	Practical	Total
25ECESEC301	Statistical Maths	SM	3	-	-	3	-	-	3
25ECEPCC301	Electrical Machine	EM	3	-	-	3	-	-	3
25ECEPCC302	Data Structure & Algorithms	DSA	3	-	-	3	-	-	3
25ECEPCC303	Database Management System	DBMS	2	-	-	2	-	-	2
25ECEMDC301X	Multidisciplinary Minor Course I	MDC-1	2	-	-	2	-	-	2
25AE302X	Modern Language	ML	2	-	-	2	-	-	2
25ECEPCL301	Electrical Machine Lab	EMPS-L	-	-	2	-	-	1	1
25ECEPCL302	Data Structure & Algorithm Lab	DSA-L	-	-	2	-	-	1	1
25ECEPCL303	Database Management System Lab	DBMS-L	-	-	2	-	-	1	1
25ECESEC302	Problem Solving and Aptitude Building - I	PSAB-I	2	-	-	2	-	-	2
25AE303	Entrepreneurship Development	ED	2	-	-	2	-	-	2
TOTAL			27 hrs			22 Credits			

Semester - III								
Course Code	Course Name	Course Abbr	Internal Assessment		External Assessment		TOTAL	
			CIA	MSE	ESE	Prac / Pres / Oral		
25ECESEC301	Statistical Maths	SM	20	30	50	-	100	
25ECEPCC301	Electrical Machine	EM	20	30	50	-	100	
25ECEPCC302	Data Structure & Algorithms	DSA	20	30	50	-	100	
25ECEPCC303	Database Management System	DBMS	20	20	40	-	80	
25ECEMDC301X	Multidisciplinary Course I	MDC-1	20	20	40	-	80	
25AE302X	Modern Language	ML	50	-	-	-	50	
25ECEPCL301	Electrical Machine Lab	EMPS-L	25	-	-	25	50	
25ECEPCL302	Data Structure & Algorithm Lab	DSA-L	25	-	-	25	50	
25ECEPCL303	Database Management System Lab	DBMS-L	25	-	-	25	50	
25ECESEC302	Problem Solving and Aptitude Building - I	PSAB-I	50	-	-	-	50	
25AE303	Entrepreneurship Development	ED	50	-	-	-	50	
TOTAL			455		305		760	

SEMESTER - III SCIENCES & ENGINEERING COURSES

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECESEC301	Statistical Mathematics	3	0	0	3	0	0	3
		Evaluation Scheme						
		Component		CIA	MSE	ESE	Total	
		Theory		20	30	50	100	

Prerequisite: Engineering Mathematics I & II

Course Objectives: To build a strong mathematics foundation to support advanced engineering studies

Course Outcomes (COs): At the end of the course, students will be able to

CO1	Apply the concept of eigenvalues and eigenvectors to solve engineering problems.
CO2	Apply the concept of Correlation and Regression to solve engineering problems.
CO3	Apply the concepts of Probability and expectations for getting the spread of the data and use standard distribution functions.
CO4	Apply the concept of hypothesis testing and parametric and non-parametric test to solve engineering problems

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	1.1	Linear Algebra: Matrix Theory Characteristic equation, Eigenvalues and Eigenvectors	CO1	3	07
	1.2	Example based on properties of Eigenvalues (Without Proof).			
	1.3	Cayley-Hamilton theorem (Without proof), Examples based on verification of Cayley-Hamilton theorem and compute inverse of Matrix.			
	1.4	Diagonalization of matrices. Self-learning Topics: Application of Matrix Theory in machine learning and google page rank			

		algorithms, derogatory and non-derogatory matrices. (1hr)			
2	2.1	Statistical Techniques Karl Pearson's Coefficient of correlation (r)	C02	3	07
	2.2	Spearman's Rank correlation coefficient (R) (repeated and non-repeated ranks)			
	2.3	Lines of regression.			
	2.4	Fitting of first- and second-degree curve Self-learning Topics: Covariance, fitting of exponential curve. (1 hr)			
3	3.1	Probability Definition and basics of probability	C03	3	07
	3.2	Discrete and continuous random variable with probability distribution and Probability density function			
	3.3	Expectation, Variance			
	3.4	Moment generating function, Raw and central moments up to 4th order. Self-learning Topics: Conditional probability, Bayes' theorem (1hr)			
4	4.1	Probability distributions Introduction	3	3	07
	4.2	Binomial distribution			
	4.3	Poisson distribution			
	4.4	Normal distribution Self-learning Topic: Applications of Probability Distributions in Engineering (1hr)			
5	5.1	Sampling Theory I Sampling distribution, Test of Hypothesis, Level of Significance, Critical region, One-tailed, and two-tailed test, Degrees of freedom. Errors in testing of hypothesis	4	3	08
	5.2	Large Sample: Testing the hypothesis that the population mean is μ			

	5.3	Small sample test: Students' t-distribution			
	5.4	Test the significance for the difference between means of two samples Self-learning topics: Test significance of difference between the means for Large samples, Estimate parameters of a population (2hrs)			
6	6.1	Chi square test: Test of goodness of fit and independence of attributes.	4	3	06
	6.2	Contingency table			
	6.3	Analysis of Variance(F-Test): One way Classification Self-learning topic: Yate's Correction (1hr)			

Text Book:

1	Dr B.S. Grewal, " <i>Higher Engineering Mathematics</i> ", Khanna Publications, 4 nd Edition
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Reference Books:

1	H. K. Das, " <i>Advanced Engineering Mathematics</i> ", S. Chand, 28 th Edition
2	Erwin Kreyszig, " <i>Advanced Engineering Mathematics</i> ", John Wiley & Sons, 10 th Edition.
3	Matrices, Shanti Narayan, S. Chand publication
4	T. Veerarajan, "Probability, Statistics and Random Processes", McGraw-Hill Education.

SEMESTER - III PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEPCC301	Electrical Machine	3	0	0	3	0	0	3
		Evaluation Scheme						
		Component		IA-I	MSE	ESE	Total	
		Theory		20	30	50	100	

Prerequisite: Ohm's Law, Kirchhoff's Laws, and simple circuit analysis is essential. Magnetic flux, MMF, reluctance, and hysteresis. Phasors, impedance, and power factor. Faraday's and Lenz's Laws.

Course Objectives:

The course is aimed:

1. To impart the knowledge of working principles, operations, and performance of DC Machine
2. To impart the knowledge of speed torque control and braking techniques of DC motors.
3. To impart the knowledge of various testing methods of DC motors.
4. To impart the knowledge of working principles, operations, performance, and applications of single-phase Transformers.
5. To impart the knowledge of working principles, operations, performance, and applications of three-phase Transformers and Single-phase autotransformers

Course Outcomes (COs): At the End of the course students will be able to

CO1	To illustrate the principle of energy conversion in single and double-excited machines.
CO2	To analyze the effect of performance parameters of DC motors.
CO3	To analyze the performance of DC machines by conducting various tests.
CO4	Illustrate the working principle and performance of single-phase transformer under different operating conditions
CO5	To analyze various types of connections and performance of 3-phase transformers under various conditions and to understand the working principle of autotransformers.

Module No.	Detailed Contents	CO Mapped	BL	Hrs
1	ELECTROMECHANICAL ENERGY CONVERSION		L2	5

	1.1	Principle, Energy stored in magnetic field,	C01		
	1.2	Torque in singly excited magnetic field, Doubly excited magnetic field,			
	1.3	Torque from energy and co- energy. Dynamic equations.			
2	DC MACHINES		C02	L2	12
	2.1	EMF and Torque equation, Concept of back EMF,			
	2.2	Armature reaction, Methods to minimize the effect of Armature reaction,			
	2.3	Process of commutation, Methods to improve commutation.			
	2.4	Necessity of Starter, Characteristics of DC motors,			
	2.5	Electrical braking (Rheostatic, regenerative and Plugging with numerical)			
	2.6	Speed control of DC shunt and series Motor, Losses and efficiency.			
3	TESTING OF DC MOTOR		C03	L3	5
	3.1	Retardation test, Brake test, load test, Swinburne test,			
4	SINGLE PHASE TRANSFORMER		C04	L3	10
	4.1	Review of working principle, EMF equation and Equivalent Circuit, phasor diagram (Resistive, Inductive and capacitive load),			
	4.2	Voltage regulation, Losses and Efficiency, condition for Maximum Efficiency,			
	4.3	Parallel operation: No load operation, on load operation: - Equal voltage operation and unequal voltage operation,			
	4.4	Testing of Transformer: OC and SC test, Sumpner's Test			
5	THREE PHASE TRANSFORMERS		C05	L2	10
	5.1	Constructional details, Connections, and Phasor groups, parallel operation, Excitation Phenomenon in transformers,			
	5.2	Harmonics in three-phase transformers,			

	5.3	Oscillating neutral phenomenon, Switching in transient phenomenon,			
	5.4	Open delta or V - connection, Three phases to two-phase conversion (Scott connection).			
	5.5	Construction, working, Saving in conductor material, Advantages & Disadvantages of Autotransformer Transformer, Applications.			
Self-Study		1. Types of Starter used for DC motor. 2. Concept of soft starting 3. Three winding transformers,			3
TOTAL HOURS					42*
Note: * Total of 42 hours does not include self-study hours.					

Text Books:	
1	I.J. Nagrath & D.P. Kothari, Electric Machines, McGraw Hill Education
2	M.G. Say, Performance and Design of AC Machines, CBS Publishers & Distributors
3	A.E. Fitzgerald, Charles Kingsley Jr., and Stephen D. Umans, Electric Machinery, McGraw Hill Education.
4	G.C. Garg, Electrical Machines (Vol. 1: DC Machines & Transformers), Khanna Publishers
Reference Books:	
1	Ashfaq Husain, Electric Machines, Dhanpat Rai and Co.
2	Bimbhra P.5., Electric Machinery, Khanna Publisher
3	Birnbhra P.5., Generalized Machine Theory, Khanna Publisher
4	B.L. Theraja & A.K. Theraja, A Textbook of Electrical Technology (Vol. 2: AC & DC Machines), S. Chand Publishing

NPTEL/ Swayam Course:

1. Course: Electrical Machines – II By Prof. Tapas Kumar Bhattacharya (IIT Kharagpur)

<https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ee01/>

2. Course: Electrical Machines By Prof. Bhuvaneshwari (IIT Delhi)

https://swayam.gov.in/nd1_noc19_ee69/preview

SEMESTER - III PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEPCC302	Data Structure and Algorithms	3	0	0	3	0	0	3
		Evaluation Scheme						
		Component		CIA	MSE	ESE	Total	
		Theory		20	30	50	100	

Prerequisite: Python Programming

Course Objectives:

1. To understand and demonstrate basic data structures (such as Arrays, linked list, stack, queue, binary tree, and graph).
2. To implement various operations on data structures.
3. To study different sorting and searching techniques.
4. To choose efficient data structures and apply them to solve real world problems.

Course Outcomes (COs): At the End of the course students will be able to

CO 1	Implement and apply basic operations on various linear and nonlinear data structures such as arrays, stacks, and queues.
CO 2	Apply linked list operations and implementations
CO 3	Apply tree-based operations and algorithms to solve problems.
CO 4	Apply graph and tree traversal algorithms to solve problems.
CO 5	Select appropriate sorting and searching techniques for a given problem.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	1.1 Introduction to Data Structures		CO 1	L3	14
	1.1.1	Introduction to Data Structures, Types of Data Structures – Linear and Nonlinear, Operations on Data Structures, Concept of array, Static arrays vs. Dynamic Arrays, structures.			
	1.2 Algorithm Basics				

	1.2.1	Introduction to Analysis of Algorithms, characteristics of algorithms, Time and Space complexities, Asymptotic notations.			
	1.3 Stack Data Structure				
	1.3.1	Introduction, Basic Stack Operations, Representation of a Stack using Array, Applications of Stack – Well form-ness of Parenthesis, Infix to Postfix Conversion and Postfix Evaluation.			
	1.4 Queue Data Structure				
	1.4.1	Queue, Operations on Queue, queue-Round Robin Algorithm.			
2	Linked List		CO 2	L3,4,5	8
	2.1	Introduction, Representation of Linked List, Linked List v/s Array, Types of Linked List - Singly Linked List (SLL), Operations on Singly Linked List: Insertion, Deletion, reversal of SLL, Print SLL.			
	2.2	Implementation of Stack and Queue using Singly Linked List.			
	2.3	Introduction to Do Representation of a Queue using array, Circular Queue, concept of priority Queue, Applications of Qubly Linked List and Circular Linked List			
3	Trees		CO 3	L3,4,5	8
	3.1	Introduction, Tree Terminologies			
	3.2	Binary Tree, Types of Binary Tree, Representation of Binary Trees, Binary Tree Traversals, Binary Search Tree Operations on Binary Search Tree			
	3.3	Applications of Binary Tree – Expression Tree, Huffman Encoding.			
4	Graphs		CO 4	L3,4,5	5
	4.1	Introduction, Graph Terminologies			
	4.2	Representation of graph (Adjacency matrix and adjacency list), Graph Traversals – Depth First Search (DFS) and Breadth First Search (BFS)			
	4.3	Application – Topological Sorting.			

5	Introduction to Sorting and Searching		CO 5	L3,4,5	7
	5.1	Introduction to Searching: Linear search, Binary search			
	5.2	Sorting: Internal vs External Sorting, Sorting Techniques: Bubble, Insertion, selection, Quick Sort, Merge Sort, Radix Sort, Comparison of sorting Techniques based on their complexity.			
Self-Study Mode		<ol style="list-style-type: none"> 1. Tree and Its Applications 2. Disjoint Set Union (DSU) / Union-Find 3. Segment Trees (and Lazy Propagation) 			3
TOTAL HOURS					42*
Note: * Total of 42 hours does not include self-study hours.					

Text Books:	
1	Data Structures and Algorithms in Python" by Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser
2	Python Data Structures and Algorithms" by Benjamin Baka
3	Data Structures and Algorithms in Python" by Rance D. Necaie
4	Introduction to Algorithms" by Cormen, Leiserson, Rivest, and Stein (with Python Examples)
5	Data Structures Using Python" by Reema Thareja
6	Algorithms and Data Structures in Python" by Md. Rezaul Karim
7	Problem Solving with Python" by Peter D. Klemens
Reference Books:	
1	Learning Data Structures with Python" by A. B. P. S. Manohar.
2	Mastering Python Data Structures" by M. O. Faruque Sarker
3	Hands-On Data Structures and Algorithms with Python" by Dr. S. S. M. K. Ali
4	Data Structures and Algorithms Made Easy in Java and Python" by Narasimha Karumanchi
5	Data Structures and Algorithms in Python: A Problem-Solving Approach" by E. Balagurusamy
6	Mastering Python Data Structures" by Samir Madhavan

SEMESTER - III PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEPCC303	Database Management System	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		IA-I	MSE	ESE	Total	
		Theory		20	20	40	80	

Prerequisite: Basic Programming Concept

Course Objectives:

1. Develop entity relationship data model and its mapping to relational model
2. Learn relational algebra and formulate SQL queries
3. Apply normalization techniques to normalize the database
4. Understand concepts of transaction, concurrency control and recovery techniques

Course Outcomes (COs): At the End of the course students will be able to

CO 1	Recognize the need for a database management system and design ER/EER diagrams for real-life applications.
CO 2	Construct relational models and write relational algebra queries.
CO 3	Formulate SQL queries.
CO 4	Apply normalization techniques in relational database design and describe concepts of transaction management, concurrency control, and recovery mechanisms.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	1.1 Introduction to Database Concepts and Data Modelling		CO 1	L3	6
	1.1.1	Introduction, Characteristics of databases, File systems v/s Database systems, Data abstraction and Data Independence			
	1.2 Database System Architecture and Roles				
	1.2.1	DBMS system architecture, Database Administrator			

	1.3 Entity-Relationship Data Model				
	1.3.1	The Entity-Relationship (ER) Model, Entity types: Weak and strong entity sets, Entity sets, Types of Attributes, Keys			
	1.4 Relationships and Constraints				
	1.4.1	Relationship Types and Sets, Relationship constraints: Cardinality and Participation			
	1.5 Extended Entity-Relationship (EER) Model				
	1.5.1	Extended Entity-Relationship (EER) Model: Generalization, Specialization and Aggregation			
2	Relational Model and Relational Algebra		CO 2	L2, L3	4
	2.1	Introduction to the Relational Model			
	2.2	Relational schema and concept of keys			
	2.3	Mapping the ER and EER Model to the Relational Model			
	2.4	Relational Algebra – operators, Relational Algebra Queries.			
3	Structured Query Language (SQL)		CO 3	L2, L3	7
	3.1	Overview of SQL			
	3.2	Data Definition Commands			
	3.3	Integrity constraints: Key constraints, Domain Constraints, Referential integrity, Check constraints			
	3.4	Data Manipulation commands, Data Control commands			
	3.5	Set and string operations, aggregate function - group by, having			
	3.6	Views in SQL, joins, Nested and complex queries, Triggers			
4	4.1 Relational Database Design and Transaction Management		CO 4	L2, L3,	11
	4.1.1	Pitfalls in Relational-Database designs, Concept of normalization, Function Dependencies, First Normal Form, 2NF, 3NF, BCNF.			
	4.2	Concept of normalization			

4.2 Transaction Management				
4.2.1	Transaction Concept, Transaction states, ACID properties, Transaction Control Commands			
4.3 Concurrency Control				
4.3.1	Concurrent Executions, Serializability: Conflict and View, Concurrency Control: Lock-based, Timestamp-based protocols			
4.4 Recovery Techniques				
4.4.1	Recovery System: Log based recovery, Ensuring Consistency After Failures			
Self-Study Mode	<ol style="list-style-type: none"> 1. Database Indexing and Query Optimization 2. NoSQL Databases and When to Use Them 3. Deadlock handling 			3
TOTAL HOURS				28*
Note: * Total of 30 hours does not include self-study hours.				

Text Books:	
1	Korth, Slberchatz, Sudarshan, Database System Concepts, 6th Edition, McGraw Hill
2	Elmasri and Navathe, Fundamentals of Database Systems, 5th Edition, Pearson education
3	Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, TMH
Reference Books:	
1	Peter Rob and Carlos Coronel, Database Systems Design, Implementation and Management, Thomson Learning, 5th Edition.
2	Dr. P. S. Deshpande, SQL and PL/SQL for Oracle 10g, Black Book, Dreamtech Press.
3	G. K. Gupta, Database Management Systems, McGraw Hill., 2012

SEMESTER - III PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEPCL301	Electrical Machine Lab	0	0	2	0	0	1	1
		Evaluation Scheme						
		Component		CIA	MSE	ESE	Total	
		Laboratory		25	-	25	50	

Prerequisite:

Familiarity with Lab Equipment: Multimeters, tachometers, watmeters, and variacs.

Circuit Assembly: Comfort with wiring and interpreting circuit diagrams.

Safety Protocols: Understanding grounding, insulation, and emergency procedures.

Course Objectives: The course will enable students to:

1	To impart the knowledge on practical understanding of DC machines and their applications.
2	To impart the knowledge on practical working principle, operations, performance and applications of single phase and three phase Transformers.

Course Outcomes (COs): At the end of the course, students will be able to:

CO1	Upon successful completion of this course, the learner will be able: Illustrate and analyze the performance of DC machines.
CO2	Demonstrate different speed control and braking methods of DC motors.
CO3	To illustrate the working principle of single phase, auto-transformer and three phase transformers
CO4	To analyse various types of connections and performance of three phase transformers.

Week No.	Detailed Contents	CO Mapped	BL	Hrs
1	Speed control of DC shunt motor.	CO2	L3	2
2	Load test on DC shunt motor.	CO1	L3	2
3	Load test on DC series motor.	CO1	L3	2

4	Brake test on DC motor.	C01	L3	2
5	Retardation test of DC motor.	C01	L3	2
6	Swinburne's test on DC motors.	C01	L3	2
7	Study of transformer connections.	C03	L3	2
8	Open circuit and short circuit test on single phase transformer and find equivalent circuit parameters.	C04	L3	2
9	Open circuit and short circuit test on three phase transformer and find equivalent circuit parameters.	C04	L3	2
10	Load test on single-phase transformer	C04	L3	2
11	Simulation of Starting method of DC Motor	C02	L3	2
12	Simulation of Any Braking Method for DC Motor.	C02	L3	2
13	Simulation of speed control method of DC Motor.	C02	L3	2

Text Books:

1	I.J. Nagrath & D.P. Kothari, Electric Machines, McGraw Hill Education
2	M.G. Say, Performance and Design of AC Machines, CBS Publishers & Distributors
3	A.E. Fitzgerald, Charles Kingsley Jr., and Stephen D. Umans, Electric Machinery, McGraw Hill Education.
4	G.C. Garg, Electrical Machines (Vol. 1: DC Machines & Transformers), Khanna Publishers

Reference Books:

1	Ashfaq Husain, Electric Machines, Dhanpat Rai and Co.
2	Bimbhra P.5., Electric Machinery, Khanna Publisher
3	Birnbhra P.5., Generalized Machine Theory, Khanna Publisher
4	B.L. Theraja & A.K. Theraja, A Textbook of Electrical Technology (Vol. 2: AC & DC Machines), S. Chand Publishing

SEMESTER - III PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned				
		L	T	P	L	T		P	Total
25ECEPCL302	Data Structure Algorithm Lab	0	0	2	0	0		1	1
		Evaluation Scheme							
		Component		CIA		MSE		ESE	Total
		Laboratory		25		-		25	50

Prerequisite: Python Programming Language.

Course Objectives: The course will enable students to:

1	To implement basic data structure such as arrays, linked lists, stacks and queues
2	Solve problem involving graphs and trees
3	To develop application using data structure algorithms

Course Outcomes (COs): At the end of the course, students will be able to:

CO1	To identify the appropriate data structure as applied to specified problem definition.
CO2	To summarize operations like searching, insertion, deletion, traversing mechanism used on various data structures.
CO3	To implement practical knowledge of data structures on the application
CO4	To write programs to access the queue and stack using arrays and linked lists, binary tree and binary search tree.

Week No.	Detailed Contents	CO Mapped	BL	Hrs
1	Implement Stack ADT using array	CO 1,4	L3	2
2	Convert an Infix expression to Postfix expression using stack ADT	CO 1,3	L3, L4	2
3	Evaluate Postfix Expression using Stack ADT	CO 1,3	L3, L4	2

4	Check whether parentheses are balanced or not.	CO 1,3	L3, L4	2
5	Implement Linear Queue ADT using array	CO 1,4	L4	2
6	Implement Circular Queue ADT using array	CO 1,4	L4	2
7	Implement Priority Queue ADT using array	CO 1,4	L4	2
8	Implement Singly Linked List ADT	CO 1,2	L4	2
9	Implement Doubly Linked List ADT	CO 1,2	L4	2
10	Implement Stack ADT using Linked List	CO 1,4	L4	2
11	Implement Linear Queue ADT using Linked List	CO 1,4	L4	2
12	Implement Binary Search Tree ADT using Linked List.	CO 1,2	L3, L4	2
13	Implement Depth First Search and Breadth First Search Graph Traversal technique	CO 1,3	L3, L4	2
14	Implement searching algorithms -Linear search, Binary search	CO 1,2	L3, L4	2
15	Implement sorting algorithms (any 2)- bubble, selection, insertion, merge, quick	CO 1	L3, L4	2

Useful Link for Data Structure & Algorithm Laboratory:

[Data Structures Tutorial - GeeksforGeeks](#)
[Data Structures and Algorithms | Coursera](#)

Website Reference/ Video Courses:

[NPTEL :: Computer Science and Engineering - NOC:2016: Programming, Data structures and Algorithms](#)

<https://nptel.ac.in/courses/106106133>

SEMESTER - III PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEPCL303	Database Management Lab	0	0	2	0	0	1	1
		Evaluation Scheme						
		Component		CIA		MSE	ESE	Total
		Laboratory		25		-	25	50

Prerequisite: Discrete Structures

Course Objectives: The course will enable students to:

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

Course Outcomes (COs): At the end of the course, students will be able to:

CO 1	Design ER /EER diagram and convert to relational model for the real-world application.
CO 2	Apply DDL, DML, DCL and TCL commands.
CO 3	Write simple and complex queries
CO 4	Implement advanced database concepts including PL/SQL constructs, concurrent transactions, and frontend-backend connectivity

Week No.	Detailed Contents	CO Mapped	BL	Hrs
1	Identify the case study and detailed statement of the problem. Design an Entity-Relationship (ER) / Extended Entity Relationship (EER) model.	CO 1	L1	2
2	To design a relational model	CO 1	L1	2
3	To Perform basic DDL (Data Definition Language) commands on SQL	CO 2	L2	2

4	To Perform basic DML (Data Manipulation Language) commands on SQL	CO 2	L2	2
5	To Perform DCL (Data Control Language) commands on SQL	CO 2	L2	2
6	To Perform TCL (Transaction Control Language) commands on SQL	CO 2	L2	2
7	To Perform DRL (Data Retrieval Language) commands on SQL	CO 3	L3	2
8	To Perform SET operations on SQL	CO 3	L3	2
9	To perform view and join in SQL	CO 3	L3	2
10	Implement procedure and functions	CO4	L3	2
11	Implementation of Views and Triggers.	CO4	L3	2
12	Demonstrate Database connectivity	CO4	L4	2
13	To perform all the operations on particular case study (Mini Project)	CO4	L5	2

Useful Link for Database Management Lab:

[DBMS Tutorial - Learn Database Management System - GeeksforGeeks](#)

Website Reference/ Video Courses:

[NPTEL :: Computer Science and Engineering - NOC:Data Base Management System](#)

<https://nptel.ac.in/courses/106105175>

SEMESTER - III MULTIDISCIPLINARY COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEMDC3011	Design Thinking	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		IA-I	MSE	ESE	Total	
		Theory		20	20	40	80	

Prerequisite: Nil

Course Objectives:

This course aims to:

1. Introduces the fundamental principles and process of design thinking.
2. Explore human-centered problem-solving approaches.
3. Understand the stages of empathy, ideation, prototyping, and testing
4. Analyze design thinking frameworks and real-world applications
5. Examine visualization and storytelling as tools for innovation.

Course Outcomes (COs): At the End of the course students will be able to

CO 1	Explain the philosophy, mindset, and stages of design thinking.
CO 2	Describe frameworks used for customer empathy and defining problems.
CO 3	Use ideation tools and creativity methods for generating solutions
CO 4	Evaluate different approaches to prototyping and solution testing
CO 5	Analyze how storytelling and visualization aid design thinking

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	Introduction to Design Thinking		CO 1	2	6
	1.1	Definition and origin of design thinking			
	1.2	Design thinking vs Traditional problem-solving approaches			
	1.3	Importance of design thinking in modern innovation			
	1.4	Design thinking mindsets: empathy, experimentation, optimism			

	1.5	Overview of models: Stanford d. school 5-step process, Double Diamond model			
	1.6	Principles of human-centered design			
Case Studies: IDEO, Apple, Airbnb Activities: <ul style="list-style-type: none"> ❖ Group exercise: Identify real-world challenges ❖ Comparative discussion: Engineering Design vs. Design Thinking 					
2	Empathy and Problem Framing		CO 2	2	6
	2.1	User empathy in design thinking			
	2.2	Techniques: Observation, interviews, shadowing			
	2.3	Empathy tools: Empathy maps, journey maps			
	2.4	Framing problems: POV statements, HMW questions			
	2.5	Design thinking for social impact			
Theoretical Focus: Cognitive bias, User perspective, Systems thinking Activities: <ul style="list-style-type: none"> ❖ Field Observation (Virtual/Physical) ❖ Create Empathy Map and User Persona ❖ Develop a Problem Statement 					
3	Ideation and Creative Thinking		CO 3	4	6
	3.1	The psychology of creativity in problem solving			
	3.2	Ideation methods: Brainstorming, Mind Mapping, SCAMPER, Lateral Thinking			
	3.3	Innovation heuristics and analogies			
	3.4	Overcoming fixed mindsets and cognitive blocks			
	3.5	Convergent vs divergent thinking			
	3.6	Idea selection: Feasibility vs impact			
Case Analysis: Creative ideation at Google, IDEO Activities: <ul style="list-style-type: none"> ❖ Ideation Sprint in Teams ❖ Affinity Diagramming ❖ Concept Selection 					
4	Prototyping and Testing Strategies		CO 4	5	6
	4.1	Concept of prototyping and its purpose in design thinking			

	4.2	Types of prototypes: Low fidelity, high fidelity, MVP (theory only)			
	4.3	Prototyping strategies for products and services			
	4.4	Testing concepts: A/B testing, feedback loops, usability testing			
	4.5	Role of experimentation and failure			
	4.6	Metrics: Desirability, viability, feasibility			
<p>Discussion: Design validation through user feedback / Experimentation and learning from failure</p> <p>Activities:</p> <ul style="list-style-type: none"> ❖ Build Low-Fi Prototypes (Paper, LEGO, Sketch) ❖ Test with Peers and Refine Based on Feedback 					
5	Visualization, Storytelling and Application		CO 5	4	6
	5.1	Role of storytelling in communicating ideas			
	5.2	Storytelling structures: Pixar framework, Hero's journey			
	5.3	Visualization tools: Mind maps, affinity diagrams, journey maps			
	5.4	Scenario planning and role-based narratives			
	5.5	Strategic application of design thinking in business, education, and healthcare			
	5.6	Challenges and limitations of design thinking			
<p>Readings: Industry application cases from IBM, SAP, and educational settings</p> <p>Activities:</p> <ul style="list-style-type: none"> ❖ Prepare Final Storyboard and Pitch ❖ Present Team Prototypes + Roadmap ❖ Reflective Group Discussion 					

Text Books:

1	Tim Brown – <i>Change by Design: How Design Thinking Creates New Alternatives for Business and Society</i> , Harper Business
2	Idris Mootee – <i>Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School</i> , John Wiley & Sons
3	Jeanne Liedtka, Andrew King, Kevin Bennett – <i>Solving Problems with Design Thinking</i> , Columbia Business School Publishing

Reference Books:

1	Roger Martin – <i>The Design of Business: Why Design Thinking is the Next Competitive Advantage</i> , Harvard Business Review Press
2	Tom Kelley & David Kelley – <i>Creative Confidence: Unleashing the Creative Potential Within Us All</i> , Crown Publishing
3	Tom Kelley – <i>The Art of Innovation</i> , Currency
4	Maurício Vianna et al. – <i>Design Thinking: Business Innovation</i> , MJV Press
5	L.T.M. Blessing & A. Chakrabarti – <i>DRM, A Design Research Methodology</i> , Springer
6	Karl T. Ulrich , <i>Design: Creation of Artifacts in Society</i> , University of Pennsylvania
7	Pavan Soni , <i>Design Your Thinking</i> , Penguin India, 2020

SEMESTER III SCIENCES & ENGINEERING COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECESEC302	Problem Solving and Aptitude Building-I	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		CIA	MSE	ESE	Total	
		Theory		50	-	-	50	

Prerequisite: Basic knowledge of arithmetic and logical thinking.

Course Objectives:

1. To develop fundamental quantitative aptitude and problem-solving skills.
2. To strengthen logical reasoning and data interpretation abilities.
3. To prepare students for competitive exams and placement aptitude tests.

Course Outcomes (COs): At the End of the course students will be able to

CO1	Apply arithmetic concepts for solving real-life and placement problems.
CO2	Solve questions related to ratios, percentages, and time-based problems.
CO3	Apply algebraic concepts to solve equations and inequalities.
CO4	Demonstrate logical reasoning ability in pattern-based problems.
CO5	Analyze and interpret basic reasoning scenarios with structured techniques.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	1.1	Number Systems & Arithmetic Basics: Divisibility, LCM/HCF	CO1	L2	05
	1.2	Remainders, Simplifications			
	1.3	Fractions and Decimals			
2	2.1	Percentages, Profit & Loss: Percentage Calculations and Applications Profit, Loss, and Discount	CO2	L2	05
	2.2	Simple and Compound Interest Ratio and Proportion			

	2.3	Mixtures and Alligations			
3	3.1	Time & Work, Speed & Distance: Averages and Weighted Averages Time, Speed, and Distance	C02	L3	06
	3.2	Relative Speed and Trains Boats and Streams			
	3.3	Time and Work Pipes and Cisterns			
4	4.1	Algebra and Linear Equations: Basic Algebraic Identities Linear and Quadratic Equations	C03	L3	06
	4.2	Inequalities Problems on Ages			
	4.3	Surds and Indices Simplification Using Algebra			
5	5.1	Introduction to Logical Reasoning: Number and Letter Series Coding-Decoding	C04, C05	L2, L3	06
	5.2	Blood Relations Direction Sense			
	5.3	Ranking and Order Syllogisms and Venn Diagrams			

Text Books:

Sr. No.	Title	Author(s)	Publisher	Remarks
1	Quantitative Aptitude for Competitive Examinations	R.S. Aggarwal	S. Chand	Covers all arithmetic, algebra, DI, reasoning basics with solved examples.
2	A Modern Approach to Verbal and Non-Verbal Reasoning	R.S. Aggarwal	S. Chand	Excellent for reasoning (both verbal and non-verbal), puzzles, coding, etc.
3	Quantitative Aptitude Quantum CAT	Sarvesh K. Verma	Arihant Publications	In-depth problem solving, good for higher difficulty aptitude (Part 2 topics).

4	Fast Track Objective Arithmetic	Rajesh Verma	Arihant Publications	Useful for shortcuts and quick revision, well-suited for beginners.
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Reference Books:

Sr.	Title	Author(s)	Publisher	Remarks
1	How to Prepare for Quantitative Aptitude for CAT	Arun Sharma	McGraw Hill	Detailed theory with CAT-level problem sets; great for practice and conceptual clarity.
2	Logical Reasoning and Data Interpretation for the CAT	Nishit K. Sinha	Pearson Education	Useful for Part 2 reasoning and DI modules.
3	Analytical Reasoning	M.K. Pandey	BSC Publishing	Advanced reasoning techniques, including puzzles and arrangement problems.
4	Arihant's Master Resource Book – Logical Reasoning & Data Interpretation	Ajay Singh	Arihant Publications	All-in-one book for reasoning and DI, with beginner to advanced level questions.

SEMESTER III ABILITY ENHANCEMENT

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25AE303	Entrepreneurship Development	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		CIA	MSE	ESE	Total	
		Theory		50	-	-	50	

Prerequisite: Basic understanding of business, innovation, and management principles.

Course Objectives: To equip students with the skills to identify problems, generate innovative solutions, and develop viable prototypes using structured ideation and innovation management tools

1. To develop the mindset and skills necessary for entrepreneurial thinking and venture creation.
2. To introduce students to entrepreneurial processes including opportunity identification, business model development, and resource mobilization.
3. To enhance analytical and decision-making abilities in real-world entrepreneurial scenarios.

Course Outcomes (COs):

CO1	Apply entrepreneurial traits, ideation tools, and opportunity evaluation methods.
CO2	Analyze market needs and define a customer-focused value proposition.
CO3	Analyze start-up financing, team building, and lean strategies.
CO4	Apply business model canvas and assess venture feasibility
CO5	Evaluate and pitch entrepreneurial ideas effectively.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	Entrepreneurship Fundamentals		CO1	L3	4
	1.1	Characteristics of Entrepreneurs			
	1.2	Types of Start-ups			
	1.3	Entrepreneurial Mindset			
2	Opportunity Discovery and Ideation		CO1,	L3,	6

	2.1	Problem Identification	C02	L4	
	2.2	Opportunity Evaluation			
	2.3	Creativity and Innovation Tools (SCAMPER, Brainstorming)			
3	Business Model & Customer Discovery		C02, C04	L3, L4	6
	3.1	Business Model Canvas			
	3.2	Value Proposition Design			
	3.3	Lean Start-up Methodology			
4	Start-up Planning and Resources		C03	L4	6
	4.1	Building a Team and Co-founders			
	4.2	Start-up Financing Basics			
	4.3	Bootstrapping and Funding Options			
5	Pitching and Launch Readiness		C05	L4	8
	5.1	Investor Pitch Preparation			
	5.2	Pitching Frameworks and Techniques			
	5.3	Legal and Regulatory Aspects (MSME, Start-up India)			

Text Books:	
1	Entrepreneurship – Rajeev Roy
2	The Startup Owner’s Manual – Steve Blank
3	Innovation and Entrepreneurship – Peter F. Drucker
Reference Books:	
1	The Lean Startup – Eric Ries
2	Disciplined Entrepreneurship – Bill Aulet
3	Zero to One – Peter Thiel

Semester - IV									
Course Code	Course Name	Course Abbr	Teaching Contact Hours			Credits			
			Theory	Tutorial	Practical	Theory	Tutorial	Practical	Total
25ECEPCC401	Control System Engineering	CSE	3	-	-	3	-	-	3
25ECEPCC402	Computer Networks	CN	3	-	-	3	-	-	3
25ECEPCC403	Power System Engineering	PSE	2	-	-	2	-	-	2
25ECEMDC402X	Multidisciplinary Minor Course II	MDC-2	3	-	-	3	-	-	3
25OE401X	Open Elective-1	OE-1	2	-	-	2	-	-	2
25ECESEC402	Problem Solving & Aptitude Building II	PSAB-II	2	-	-	2	-	-	2
25ECEPCL401	Control System Engineering Lab	CSE-L	-	-	2	-	-	1	1
25ECEPCL402	Computer Networks Lab	CN-L	-	-	2	-	-	1	1
25ECEMDL402X	MDM-2 Lab	MDM-2 L	-	-	2	-	-	1	1
25ECESEC401	Communication & Personality Dev II	CPD-II	2	-	-	2	-	-	2
25ECECEP401	Community Engagement Project	CEP	-	-	4	-	-	2	2
TOTAL			25 hrs			22 Credits			

Semester - IV							
Course Code	Course Name	Course Abbr	Internal Assessment		External Assessment		TOTAL
			CAI	MSE	ESE	Prac / Pres / Oral	
25ECEPCC401	Control System Engineering	CSE	20	30	50	-	100
25ECEPCC402	Computer Networks	CN	20	30	50	-	100
25ECEPCC403	Power System Engineering	PSE	20	20	40	-	80
25ECEMDC402X	Multidisciplinary Minor Course II	MDC-2	20	30	50	-	100
25OE401X	Open Elective-1	OE-1	20	20	40	-	80
25ECESEC402	Problem Solving & Aptitude Building II	PSAB-II	50	-	-	-	50
25ECEPCL401	Control System Engineering Lab	CSE-L	25	-	-	25	50
25ECEPCL402	Computer Networks Lab	CN-L	25	-	-	25	50
25ECEMDL402X	Multidisciplinary Minor Course II	MDL-2	25	-	-	25	50
25ECESEC401	Communication & Personality Dev II	CPD-II	50	-	-	-	50
25ECECEP401	Community Engagement Project	CEP	50	-	-	-	50
TOTAL			455		305		760

SEMESTER - IV PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEPCC401	Control System Engineering	3	0	0	3	0	0	3
		Evaluation Scheme						
		Component		CIA	MSE	ESE	Total	
		Theory		20	30	50	100	

Prerequisite: Engineering Maths II, BEE

Course Objectives:

1	Modelling of electrical, mechanical and electromechanical system.
2	To learn time response analysis and demonstrate their knowledge to frequency response.
3	To learn stability analysis of system using Root Locus, Bode Plot, Polar plot and Nyquist plot

Course Outcomes (COs): At the End of the course students will be able to

C01	Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
C02	Express and solve system equations in state-variable form (state variable models).
C03	Determine the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs.
C04	Determine and analyze the (absolute) stability of a closed-loop control system
C05	Determine the stability of the system using Root locus, bode plot, polar plot, and Nyquist plot and students will be evaluated to gain margin.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	SYSTEMS COMPONENTS AND THEIR REPRESENTATION		C01	L3	12
	1.1	Terminology and Basic Structure			
	1.2	DC and AC servo Systems			
	1.3	Multivariable control system			
	MATHEMATICAL MODEL OF PHYSICAL SYSTEM				
	1.4	Feedforward and Feedback control theory Electrical and Mechanical Transfer Function Models-			
	1.5	Block reduction technique			
	1.6	Signal flow graphs.			
2	TIME RESPONSE ANALYSIS		C03	L3	9
	2.1	Transient response-steady state response			
	2.2	Performance of the standard first order and second order system			
	2.3	Effect on an additional zero and an additional pole-steady error constant and system- type number			
3	CONCEPTS OF STABILITY ANALYSIS		C04	L3	7
	3.1	Concept of stability-Bounded – Input Bounded – Output stability			
	3.2	Routh stability criterion-Relative stability-			
	3.3	Root locus concept-Guidelines for sketching root locus-Nyquist stability criterion.			
4	FREQUENCY RESPONSE AND SYSTEM ANALYSIS		C05	L3	9
	4.1	Frequency response of standard second order system			
	4.2	Polar Plot, Nyquist plots			
	4.3	Bode Plot			
5	CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS		C06	L3	5
	5.1	State variable representation-Conversion of state variable models to transfer functions			
	5.2	Conversion of transfer functions to state variable models			

	5.3	Concepts of Controllability and Observability			
Self-Study	PID controller, Digital Control				3*
TOTAL HOURS					42
Note: * Total of 42 hours does not include self-study hours					

Text Books :

1	Control System Engineering Norman Nise
2	Control System Engineering by Nagrath and Gopal
3	Modern Control System Engineering, K.Ogata

Reference Books:

1	Control System Engineering, S.K.Bhattacharya, Person
2	Control System, theory and application, Samrjit Ghosh, Person.

SEMESTER - IV PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEPCC402	Computer Networks	3	0	0	3	0	0	3
		Evaluation Scheme						
		Component		CIA	MSE	ESE	Total	
		Theory		20	30	50	100	

Prerequisite: Hardware & Networking

Course Objectives:

1. Modelling of electric, mechanical and electromechanical systems, using differential to understand the fundamental concepts of computer networking, protocols, architectures, and applications.
2. To study the multiple layer design issues, services, and state-of-the-art protocols of TCP/IP and OSI based Architectures.
3. To help students to acquire knowledge of address in the configuration of various scales of networks
4. To be conversant with the principles of Network Application Programming

Course Outcomes (COs): At the End of the course students will be able to

CO1	Enumerate the layers of OSI model and TCP/IP model and describe their functions.
CO2	Demonstrate the knowledge of networking protocols at various layers of TCP/IP model.
CO3	Classify the routing protocols and analyse how to assign the IP addresses for a given network.
CO4	Design and configure the networks using IP addressing and subnetting / supernetting schemes.
CO5	Explain the functions of Application layer and Presentation layers, their paradigms and Protocols

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	Introduction to Data Communications and Networking		C01	L2	10
	1.1	Introduction to computer networks, Network software, Layers and services, Network topologies, protocol hierarchies, design issues for the layers, connection oriented and connectionless services			
	1.2	Reference models: Layer details of OSI, TCP/IP models. Communication between layers. Internet			
	1.3	Guided Transmission Media: Twisted pair, Coaxial, Fiber optics.			
	1.4	Unguided media (Wireless Transmission): Radio Waves, Microwave, Bluetooth, Infrared, Circuit and Packet Switching			
	1.5	Network Devices: Repeaters, Hubs, Switches, Routers and Gateways			
2	Data Link Layer		C03	L2	9
	2.1	DLL Design Issues - Services, Framing, Error Control, Flow Control, Error Detection and Correction Elementary Data Link protocols, Stop and Wait, Sliding Window - Go Back N, Selective Repeat.			
	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), Introduction to wireless LAN: 802.11x.			
3	Network layer		C04	L2	9
	3.1	Network Layer design issues, Communication Primitives: Unicast, Multicast, Broadcast. Network Layer Protocols: IPv4 Datagram Format, IPv4 Addresses, IPv4 Addressing (classful and classless), Subnetting and Supernetting design problems, IPv4 Protocol, IPv6 Packet Format, IPv6 Addressing, Transition from IPv4 to IPv6			
	3.2	Routing algorithms: Intra-domain Routing -Shortest Path, Distance Vector Algorithms, Link State Routing, Inter-domain Routing Protocols.			
	3.3	Congestion control algorithms: Open loop congestion control, Closed loop congestion control, QoS parameters.			

	Transport Layer				
4	4.1	The Transport Service: Transport service primitives, Berkeley Sockets, Connection management (Handshake), UDP, TCP, TCP state transition, TCP timers	C05	L2	9
	4.2	TCP Flow control (sliding Window), TCP Congestion Control: Slow Start			
	Application layer				
5	5.1	Application layer Paradigms, Client-Server Paradigm: Application Programming Interface	C06	L2	6
	5.2	Standard Client Server applications: World Wide Web and HTTP, FTP, Electronic Mail, TELNET, Secure Shell (SSH), Domain Name System (DNS)			
Self-Study Topic		<p>Read about IPv4 Addressing (classful and classless addressing) from Textbook 1 (Tanenbaum) or Textbook 2 (Forouzan), focusing on:</p> <ul style="list-style-type: none"> ● Structure of IPv4 addresses (32-bit format, dotted-decimal notation). ● Classful addressing (Classes A, B, C, D, E) and its limitations. ● Classless Inter-Domain Routing (CIDR) and subnet masks. <p>Study the concept of subnetting and Supernetting:</p> <ul style="list-style-type: none"> ● Why subnetting is used (e.g., efficient IP address allocation, network segmentation). ● How Supernetting (route aggregation) reduces routing table size. <p>Solve 3-4 subnetting problems from the textbooks or online resources. Examples:</p> <ul style="list-style-type: none"> ● Given an IP address (e.g., 192.168.1.0/24), divide the network into 4 subnets and calculate the subnet mask, network address, broadcast address, and host range for each. ● Design a Supernetting scheme for combining smaller networks into a larger one (e.g., combining 192.168.1.0/24 and 192.168.2.0/24 into a single CIDR block). <p>Study a case scenario (e.g., “Design a network for a small organization with 3 departments, each needing 20, 10, and 5 hosts, using the IP range 192.168.1.0/24”).</p> <ul style="list-style-type: none"> ● Determine the number of subnets required. ● Calculate the subnet mask and IP address ranges for each department. ● Sketch a simple network topology showing how devices (e.g., routers, switches) connect within subnets. 			*3
Total Hours					42
Note: * Total of 42 hours does not include self-study hours					

Text Books:

1	Andrew S Tanenbaum, Computer Networks - , 4th Edition, Pearson Education
2	Behrouz A. Forouzan, Forouzan Mosharrat, Computer Networks A Top Down Approach, McGraw Hill education
3	Ranjan Bose, Information Theory, Coding and Cryptography, Ranjan Bose, Tata McGraw Hill, Second Edition.

Reference Books:

1	James F. Kurose, K. W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, 3rd Edition, Pearson Education.
2	S. Keshav, An Engineering Approach to Computer Networks, 2nd Edition, Pearson Education.
3	W. A. Shay, Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
4	L. L. Peterson and B. S. Davie, Computer Networks: A Systems Approach, 4th Ed, Elsevier India

SEMESTER - IV PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEPCC403	Power System Engineering	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		CIA	MSE	ESE	Total	
		Theory		20	20	40	80	

Prerequisite: Basic Electrical Engineering	
Course Objectives:	
1	To learn the basics of the electrical power system and its different components.
2	To understand electrical cable and earthing.
3	To get knowledge of transmission and distribution lines and its parameters.
Course Outcomes (COs): At the End of the course students will be able to	
CO1	Comprehend the power system and its components and Compare conventional and non-conventional energy sources (L2)
CO2	Compare the ac transmission / distribution lines and the overhead insulators according to its application (L2)
CO3	Calculate the parameters of different types of ac transmission / distribution lines for analysis. (L3)
CO4	Draw and analyze the PU reactance diagram of a power system. (L3)

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	Introduction:		CO1	L2	3
	1.1	Basic structure of power system: generation, transmission and distribution, single line			
	1.2	Diagram of typical AC supply system, different types of conventional and non-conventional energy sources			

	1.3	Conventional and non - conventional energy sources working principle and operation with block diagram.			
2	Types of AC Transmission / Distribution Lines and Insulators:		C02	L2	8
	2.1	Types of AC Transmission / Distribution Lines: single phase two wire, three phases three wire (symmetrical and unsymmetrical spacing)			
	2.2	Three phase double circuit, three phase four wire, concept of composite and bundle conductor.			
	2.3	Insulators: Type of insulators, potential distribution across insulator string, string efficiency, methods for improving string efficiency (Numerical).			
3	Transmission / Distribution Line Parameters:		C03	L3	9
	3.1	Resistance of transmission line, skin effect, proximity effect, definition of inductance, internal and external flux linkage of single conductor,			
	3.2	Inductance of single phase two wire line, inductance of three phase three wire line with symmetrical and unsymmetrical spacing, concept of GMR and GMD,			
	3.3	Inductance of three phase double circuit line, inductance of bundled conductor lines, Capacitance of transmission line, capacitance of single-phase line,			
	3.4	Capacitance of three phase line with symmetrical and unsymmetrical spacing, effect of earth on transmission line capacitance (single phase only) (Numerical)			
4	Representation of Power System Components:		C04	L3	8
	4.1	Introduction, single phase solution of balanced three phase networks, one-line diagram.			
	4.2	Impedance or reactance diagram, Per Unit (PU) system, advantage of PU system, PU impedance diagram, representation of load (Numerical).			

	4.3	Classification and modelling of short, medium and long lines, regulation and efficiency of short and medium lines, Ferranti effect, evaluation			
Self-Study	Two port networks, renewable energy sources. Electric cables and Earthing its types.				3*
TOTAL HOURS					28
Note: * Total of 28 hours does not include self-study hours					

Text Books:

1	Fredrick T Morse, Power Plant Engineering, East-West Press Pvt Ltd
2	Mahesh Verma, Power Plant Engineering, Metropolitan Book Co Pvt Ltd
3	RK Rajput, A Text Book of Power System engineering, Laxmi Publication

Reference Books:

1	Stevenson and Grainger, Modern Power System Analysis, 1 Edition, TMH publication
2	W. D. Stevenson, Elements of Power System, 4 Edition TMH

SEMESTER - IV PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEPCL401	Control System Lab	0	0	2	0	0	1	1
		Evaluation Scheme						
		Component		CIA	MSE	ESE	Total	
		Laboratory		25	-	25	50	

Prerequisite: Engineering Maths II

Course Objectives: The course will enable students to:

1	To study the basic components of a control system.
2	To employ time domain analyses to predict and diagnose transient parameters of the system for standard input functions to ascertain the required dynamic response from the system.

Course Outcomes (COs): At the end of the course, students will be able to:

CO 1	Illustrate the functioning of various components of the control system.
CO 2	Analyze the response of the physical system for various inputs.
CO 3	Analyze and interpret stability of the system through Root Locus, Bode plot and Nyquist plots.
CO 4	Execute time response analysis of first order and second order control system using MATLAB

Week No.	Detailed Contents	CO Mapped	BL	Hrs
1	Analyze the transfer function and pole-zero plot of a control system.	CO1	L4	2
2	To determine Step Response and impulse response of 1st order transfer function	CO4	L3	2
3	To determine Step Response and impulse response of 2nd order transfer function	CO4	L3	2
4	To determine step and impulse response of Type 0, Type 1 and Type 2 system	CO2	L3	2

5	Study the effect of addition of zeros to the forward path transfer function of a closed loop system	C01	L3	2
6	Study the effect of addition of poles to the forward path transfer function of a control system	C01	L3	2
7	To obtain root locus for a given transfer function of the system	C03	L3	2
8	To obtain bode plot for a given transfer function of the system	C03	L3	2
9	To obtain Nyquist plot of a second order system	C03	L3	2
10	To study the effect of PI, PD and PID controller on a control system	C02	L3	2

Note: It is appreciated if the faculty choose different problem statements for different student batches.

Text Books:	
1	Control System Engineering Norman Nise
2	Control System Engineering by Nagrath and Gopal
3	Modern Control System Engineering, K.Ogata
Reference Books:	
1	Control System Engineering, S. K. Bhattacharya, Person
2	Control System, theory and application, Samrjit Ghosh, Person.

SEMESTER - IV PROGRAM CORE COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECEPCL402	Computer Networks Lab	0	0	2	0	0	1	1
		Evaluation Scheme						
		Component		CIA		MSE	ESE	Total
		Laboratory		25		-	25	50

Prerequisite: Hardware & Networking

Course Objectives: The course will enable students to:

1	Modelling of electric, mechanical and electromechanical systems, using differential to understand the fundamental concepts of computer networking, protocols, architectures, and applications.
2	To study the multiple layer design issues, services, and state-of-the-art protocols of TCP/IP and OSI based Architectures.
3	To help students to acquire knowledge of address in the configuration of various scales of networks
4	To be conversant with the principles of Network Application Programming

Course Outcomes (COs): At the end of the course, students will be able to:

CO1	To design and implement small size networks and to understand various networking commands.
CO2	Implementation of TCP/IP configuration for Windows and Linux
CO3	Determine how to assign the IP addresses and configure a network on different operating environments
CO4	Configure the networks using IP addressing and subnetting / super netting schemes using various OS commands

Week No.	Detailed Contents	CO Mapped	BL	Hrs
1	Use a tool (e.g. NS2) to implement a specific Network topology with respect to the given number of nodes and physical configuration and do: Graphical simulation of network with Routing Protocols and traffic consideration (TCP, UDP) Analysis of network performance for quality parameters such as packet-delivery-ratio, delay, and throughput	C01	L3	2
2	Socket programming using TCP and/or UDP	C01	L3	2
3	Use basic networking commands in Linux (ping, tracert, nslookup, netstat, ARP, RARP, IP, ifconfig, dig, route, etc.) and set up a network environment with multiple IP addresses and configuration of ARP tables. Set up a network environment in the Windows platform also.	C01	L3	2
4	Working with routing in Linux/windows: View the current routing table Add and delete routes Change default gateway Perform IP Tables for IP forwarding	C02	L3	2
5	Set up and configuration of firewalls in Linux/windows (Use IPTables)	C02	L3	2
6	Packet Sniffing using Wireshark	C02	L3	2
7	Use basic commands of Linux (ping, tracert, nslookup, ARP, RARP, netstat, IP, ifconfig, dig, route)	C03	L3	2
8	Perform remote login using Telnet server	C03	L3	2
9	Perform file transfer and access using FTP	C03	L3	2
10	Design VPN and configure RIP/OSPF using packet tracer.	C04	L3	2
11	Use simulator (e.g. NS2) to understand functioning of ALOHA, CSMA/CD	C04	L3	2
12	Perform network discovery using discovery tools (e.g. NMAP, MRTG)	C04	L3	2

Text Books:

1	Andrew S Tanenbaum, Computer Networks -, 4th Edition, Pearson Education
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2	Behrouz A. Forouzan, Forouzan Mosharrat, Computer Networks A Top Down Approach, McGraw Hill education
3	Ranjan Bose, Information Theory, Coding and Cryptography, Ranjan Bose, Tata McGraw Hill, Second Edition.

Reference Books:

1	James F. Kurose, K. W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, 3rd Edition, Pearson Education.
2	S. Keshav, An Engineering Approach to Computer Networks, 2nd Edition, Pearson Education.
3	W. A. Shay, Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
4	L. L. Peterson and B. S. Davie, Computer Networks: A Systems Approach, 4th Ed, Elsevier India

Useful Link for Data Structure and Algorithm Laboratory:

Online Tutorial Links:

1. www.leetcode.com
2. <https://www.tutorialspoint.com>
3. <https://www.w3schools.com/>
4. <https://www.geeksforgeeks.org/>
5. <https://realpython.com/>
6. <https://www.programiz.com/>
7. <https://www.pythonforbeginners.com/>

SEMESTER - IV EXPERIENTIAL LEARNING COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECECEP401	Community Engagement Project	0	0	4	0	0	2	2
		Evaluation Scheme						
		Component		CIA		MSE	ESE	Total
		Laboratory		50		-	25	75

Prerequisite: Programming and TechShop Lab

Course Objectives:

1. Expose students to socio-economic challenges related to energy access in communities.
2. Apply concepts from circuit theory, control systems, and electronics to design sustainable solutions.
3. Develop skills in fieldwork, problem-solving, and stakeholder communication.
4. Foster empathy and social responsibility through community engagement.

Course Outcomes (COs): At the End of the course students will be able to

CO1	Identify and analyse challenges in underserved communities
CO2	Design and simulate sustainable solutions using domain principles.
CO3	Collaborate effectively with peers and community stakeholders.
CO4	Document and present project outcomes, reflecting on their societal impact.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	Preparation and Planning		CO1	L3 & L4	10
	1.1	Orientation on community engagement principles (2 hours).			
	1.2	Literature review and study of sustainable energy technologies (4 hours).			
	1.3	Initial community visits to assess needs (4 hours).			

2	Fieldwork and Solution Development		CO2 CO3	L5	36
	2.1	Community interaction and data collection on challenges (16 hours).			
	2.2	Design and simulation of solutions (12 hours).			
	2.3	Prototype development and testing under faculty supervision (8 hours).			
3	Documentation and Dissemination		CO4	L5	10
	3.1	Preparation of a detailed project report (6 hours).			
	3.2	Presentation to community stakeholders and faculty (2 hours)			
	3.3	Reflective analysis and independent study (2 hours).			

Example:

Title: Sustainable Energy Solutions for Community Development

Activities

- **Fieldwork (26–30 hours):** Engage with community members to understand their energy needs (e.g., lack of reliable power, high energy costs). Conduct surveys and interviews to gather data.
- **Solution Design (12 hours):** Apply concepts from analog electronics, control systems, and renewable energy to design solutions like solar-powered lamps or energy-efficient appliances.
- **Prototyping and Testing (8 hours):** Build and test prototypes in collaboration with peers, ensuring feasibility for community use.
- **Report and Presentation (10 hours):** Document the project process, outcomes, and community feedback in a detailed report. Present findings to stakeholders and faculty.

Assessment

The course is evaluated based on the following components:

- **Fieldwork Participation (30%):** Engagement with the community, data collection, and collaboration.
- **Prototype Design and Functionality (40%):** Technical accuracy and feasibility of the proposed energy solution.
- **Project Report (20%):** Quality of documentation, including problem analysis, solution design, and community impact.
- **Presentation and Reflection (10%):** Clarity of presentation and depth of reflective analysis on socio-economic impact.

Suggested Topics for Projects

- 1. Design of solar-powered lighting systems for rural households.**
- 2. Development of energy-efficient appliances for community centers.**
- 3. Implementation of small-scale renewable energy systems for agricultural use.**
- 4. Smart energy monitoring systems for low-income households.**

SEMESTER - IV SCIENCES & ENGINEERING COURSES

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECESEC402	Problem Solving and Aptitude Building Part-II	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		CIA		MSE	ESE	Total
		Theory		50		-	-	50

Prerequisite: Completion of Part-1 or equivalent problem-solving foundation

Course Objectives:

1. To enhance understanding of complex aptitude and reasoning patterns.
2. To develop analytical thinking through data interpretation and puzzles.
3. To prepare for aptitude-based recruitment assessments and competitive exams.

Course Outcomes (COs): At the End of the course students will be able to

CO1	Analyze data using arithmetic and tabular methods.
CO2	Apply mensuration and geometry concepts in real-life contexts.
CO3	Solve problems involving counting principles and probability.
CO4	Use structured logic to solve puzzles and reasoning problems.
CO5	Apply critical thinking to abstract reasoning and decision-making problems.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	1.1	Module 1: Advanced Arithmetic & Data Interpretation: Advanced Percentage and Interest Calculations	CO1	L3	05
	1.2	Partnerships and Investments			
	1.3	Data Interpretation Basics (Tables, Pie Charts, Bar Graphs) Caselet DI			
2	2.1	Module 2: Geometry and Mensuration: Basic Geometric Shapes and Properties Triangles, Circles, Quadrilaterals	CO2	L3	05

	2.2	Mensuration Formulas (2D and 3D) Area, Volume, Surface Area Problems			
	2.3	Coordinate Geometry Basics			
3	3.1	Module 3: Permutations, Combinations & Probability: Fundamental Counting Principle Permutations and Combinations	C03	L3	05
	3.2	Factorials and Arrangements Basic Probability and Conditional Probability			
	3.3	Problem Solving Techniques			
4	4.1	Module 4: Advanced Logical Reasoning: Puzzles and Seating Arrangements (Linear and Circular)	C04	L3	05
	4.2	Input-Output Logical Deductions			
	4.3	Statements & Assumptions Statements & Conclusions			
5	5.1	Module 5: Analytical and Abstract Reasoning: Analytical Decision Making Pattern Recognition	C05	L3	06
	5.2	Cube and Dice Problems Clocks and Calendars			
	5.3	Cause and Effect Critical Thinking and Problem-Solving Techniques			

Text Books:				
Sr. No.	Title	Author(s)	Publisher	Remarks
1	Quantitative Aptitude for Competitive Examinations	R.S. Aggarwal	S. Chand	Covers all arithmetic, algebra, DI, reasoning basics with solved examples.
2	A Modern Approach to Verbal and Non-Verbal Reasoning	R.S. Aggarwal	S. Chand	Excellent for reasoning (both verbal and non-verbal), puzzles, coding, etc.

3	Quantitative Aptitude Quantum CAT	Sarvesh K. Verma	Arihant Publications	In-depth problem solving, good for higher difficulty aptitude (Part 2 topics).
4	Fast Track Objective Arithmetic	Rajesh Verma	Arihant Publications	Useful for shortcuts and quick revision, well-suited for beginners.

Reference Books:				
Sr.	Title	Author(s)	Publisher	Remarks
1	How to Prepare for Quantitative Aptitude for CAT	Arun Sharma	McGraw Hill	Detailed theory with CAT-level problem sets; great for practice and conceptual clarity.
2	Logical Reasoning and Data Interpretation for the CAT	Nishit K. Sinha	Pearson Education	Useful for Part 2 reasoning and DI modules.
3	Analytical Reasoning	M.K. Pandey	BSC Publishing	Advanced reasoning techniques, including puzzles and arrangement problems.
4	Arihant's Master Resource Book – Logical Reasoning & Data Interpretation	Ajay Singh	Arihant Publication s	All-in-one book for reasoning and DI, with beginner to advanced level questions.

SEMESTER - IV SCIENCES & ENGINEERING COURSES

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25ECESEC401	Communication & Personality Development -II (CPD-II)	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		CIA	MSE	ESE		Total
		Theory		50	-	-		50

Prerequisite: Basic English language fluency

Course Objectives:

1. Critically analyse technical documents and other literature for understanding and development of thoughts.
2. Listen and understand the dynamics of professional communication in the form of group discussions, presentations, etc. required for career enhancement.
3. Analyse personal traits, interests, values, aptitudes and skills.
4. Understand the importance of integrity and develop a personal code of ethics.

Course Outcomes (COs): At the End of the course, students will be able to

CO1	Comprehend various technical literature to develop the competency of formal communication
CO2	Develop student's ability to actively listen, participate effectively in GD and deliver clear, engaging presentations.
CO3	Understand the role of communication in personal and professional success.
CO4	Demonstrate effective individual professional ethics at the workplace.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	1.1	READING AND WRITING SKILLS: Critical Reading: Understanding the concept of critical reading	1	L1 L2 L3	6
	1.2	Applying critical reading skills to analyse a given text.			
	1.3	Read and Summarise a Research paper (Environment, Sustainability and Social aspects)			

	1.4	Read a book (fiction / non-fiction) and prepare a review on it.			
2	2.1	LISTENING & SPEAKING SKILLS: Listening Comprehension (Motivational Talks or TED TALKS): Pronunciation, intonation, Stress and Rhythm	2	L1 L2 L3	10
	2.2	Group Discussion: Principles of Group Discussion, Do's and Don'ts of Group Discussion			
	2.3	Giving Presentations: Dealing with Stage Fear, Planning, Structuring and Delivering Presentation			
3	3.1	PERSONAL DEVELOPMENT PLANNING: Self- Assessment strategies (SWOT Analysis)	3	L1 L2 L3	5
	3.2	Digital Footprints-Maintaining a Professional Persona			
	3.3	Goal Setting: (Defining goals, Types of goals, Establishing SMART goals, Steps in setting goals, Goal setting activity)			
4	4.1	PROFESSIONAL ETHICS: Body language	4	L1 L2 L3	7
	4.2	Assertive Behaviour & Conflict Resolution			
	4.3	Decision-making Skills			
	4.4	Leadership and Qualities of a successful leader			
	4.5	Character-building			
	4.6	Work Ethics and Etiquette.			

LIST OF ASSIGNMENTS:

(In the form of Short Notes, Questionnaire / MCQ Test, Role Play, Case Study, Quiz, etc.)

Sr. No.	Assignment Questions
1	Literature Review of Research Papers
2	Summary of a (fiction / non-fiction) Book
3	Summary of a TED talk / Motivational Video
4	Based on SWOT analysis, create a plan that leverages strengths, minimizes weakness, capitalizes on opportunities and mitigates threats.
5	Write a personal essay reflecting your experiences, values & aspirations.
6	How to use body language effectively?
6	Describe your favourite leader highlighting his key skills.
7	Write in detail about a personal set of values that determines how an employee behaves in the workplace.

Note:

1	<i>The group size for the presentation and group discussion should not be less than 5 students or exceed 7 students.</i>
2	<i>There will be an end-semester presentation on any technical topic.</i>

Recommended Books:**A] Text Books:**

1. Communication Skills by Sanjay Kumar & Pushp Lata
2. Effective Technical Communication: A Guide for Scientists and Engineers by Rizvi

B] References:

1. Arms, V. M. (2005). *Humanities for the engineering curriculum: With selected chapters from Olsen/Huckin: Technical writing and professional communication, second edition*. Boston, MA: McGraw-Hill.
2. Bovée, C. L., & Thill, J. V. (2021). *Business communication today*. Upper Saddle River, NJ: Pearson.
3. Butterfield, J. (2017). *Verbal communication: Soft skills for a digital workplace*. Boston, MA: Cengage Learning.
4. Masters, L. A., Wallace, H. R., & Harwood, L. (2011). *Personal development for life and work*. Mason: South-Western Cengage Learning
5. Robbins, S. P., Judge, T. A., & Campbell, T. T. (2017). *Organizational behaviour*. Harlow, England: Pearson.
6. Meenakshi Raman, Sangeeta Sharma (2004) *Technical Communication, Principles and Practice*. Oxford University Press
7. Archana Ram (2018) *Place Mentor, Tests of Aptitude for Placement Readiness*. Oxford University Press