ANJUMAN-I-ISLAM's KALSEKAR TECHNICAL CAMPUS
SCHOOL OF ENGINEERING & TECHNOLOGY

(Autonomous Institute Affiliated to University of Mumbai)

SECOND YEAR NEP 2020

SEMESTER III

Department of Electrical & Computer Engineering

Syllabi Effective from Academic Year 2026-27

Preamble

The Government of Maharashtra has mandated Autonomous Colleges to revise their curricula in alignment with the transformative vision of the National Education Policy (NEP) 2020. At Anjuman-I-Islam's Kalsekar Technical Campus, School of Engineering & Technology, Department of Electrical & Computer Engineering, we pledge to implement NEP 2020 with unwavering commitment to its principles, fostering an educational ecosystem that prioritizes holistic development and innovation.

Rooted in Anjuman-I-Islam's Kalsekar Technical Campus, School of Engineering & Technology, legacy of inclusive and value-driven education, our program has embraced the philosophy of NEP 2020 to design a forward-thinking curriculum under our autonomous status, affiliated with the University of Mumbai. Building on early initiatives to integrate holistic learning, we are proud to introduce a comprehensive curriculum for 2025-29, tailored to nurture well-rounded engineers equipped for global challenges.

This curriculum adopts a multidisciplinary approach, ensuring a robust foundation in science, mathematics, and core electrical and computer engineering principles. It offers specialized expertise through a sequence of domain-specific electives, complemented by a "Multidisciplinary Minor" to broaden intellectual horizons. Students gain practical, industry-relevant skills through a semester-long internship in industry or research, alongside collaborations with external partners to deliver cutting-edge skill-based courses. High-achieving learners are challenged through an "Honors" evaluation track, while soft skills, leadership, and social, ethical, and environmental awareness are systematically developed through carefully curated Liberal Learning and Humanities modules.

By integrating technical proficiency, interdisciplinary knowledge, and personal growth, this curriculum embodies a unique, liberal model of engineering education. It prepares students not only to excel in their professional careers but also to contribute meaningfully to society as innovative, responsible, and ethically grounded leaders, in full alignment with the spirit of NEP 2020.

VISION, MISSION STATEMENTS OF SCHOOL / DEPARTMENT

School Name: Engineering & Technology

Vision
To be the most sought after Academic, Research and Practice-based School of Engineering & Technology that others would wish to emulate.
Mission
Creating Exuberant Engineering Professionals.

Department: Electrical & Computer Engineering

Vision
To be the most sought after Academic, Research and Practice-based Department of Electrical & Computer Engineering that others would wish to emulate.
Mission
Creating Exuberant Electrical & Computer Engineering Professionals.
Mission Elements
Provide high quality innovative educational programs.
Prepare graduates for technical and leadership qualities.
Pursue excellence in scholarly research, commit our faculty expertise.
Provide facilities to the service of the industry.

Program Educational Objectives (PEOs)

Technical Expertise: Equip graduates with strong engineering skills to innovate and solve complex problems using modern tools, fostering critical thinking.

Interdisciplinary Growth: Enable integration of knowledge from AI, IoT, and renewable energy for adaptable, holistic development.

Ethical Leadership: Develop professionals with ethical practices, leadership, and communication skills for societal and environmental contributions.

Lifelong Learning: Prepare graduates for continuous learning, higher education, and global competitiveness.

Entrepreneurship: Foster industry-ready skills and entrepreneurial mindset for innovation and employability.

Program Outcomes (POs)

PO1	**Engineering knowledge**	Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems
PO2	**Problem analysis**	Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3	**Design / Development of Solutions**	Design creative solutions for complex engineering problems and design / develop systems / components / processes to meet identified needs with consideration for the public health and safety, whole life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4	**Conduct Investigations of Complex Problems**	Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO5	**Modern Tool Usage**	Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6	**The Engineer and the World**	Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO7	**Ethics**	Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9
PO8	**Individual and Collaborative Team Work**	Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	**Communication Skills**	Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO10	**Project Management and Finance**	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	**Life-long Learning**	Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies

		and iii) critical thinking in the broadest context of technological change. (WK8)

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Specific Outcomes (PSOs)

PSO1	Ability to offer real time and efficient solution problems that are directly related to Electrical and Computer Engineering areas and will contribute towards the development of society.
PSO2	Comprehend, Evaluate and Create computer programs to effectively design Electrical based systems with different levels of complexity.

Nomenclature of the Courses in the Curriculum

Group as per GR	Abbreviation	Course Category
Program Core Course	PCC	Program Core Course
	PCL	Program Core Lab
Program Core Elective	PEC	Program Elective Course
	PEL	Program Elective Lab
Multidisciplinary Minor	MDC	Multidisciplinary Course
	MDL	Multidisciplinary Lab
Open Elective	OE	Open Elective
Basic Science & Engineering Science Courses	SEC	Science & Engineering Courses
	SEL	Sciences & Engineering Lab
Skill Based Course	VSL	Vocational Skill Lab
Ability Enhancement Course	AE	Ability Enhancement
	VE	Value Education
	IKS	Indian Knowledge System
	CC	Co-curricular Course
Experiential Learning	CEP	Community Engagement Project
	MIP	Mini Project
	MAP	Major Project
	INT	Internship
	LL	Lifelong Learning

List of Courses under Sciences & Engineering and its Abbreviation

Sr. No.	Subject Name	Abbreviation
1.	Engineering Maths 1	EM-I
2.	Engineering Maths 2	EM-II
3.	Statistical Maths	SM
4.	Engineering Chemistry	EC
5.	Engineering Physics	EP
6.	Engineering Mechanics	EM
7.	Communication & Personality Development – I	CPD-I
8.	Communication & Personality Development – I	CPD-II
9.	Communication & Personality Development – I	CPD-III
10.	Problem Solving and Aptitude Building – I	PSAB - I
11.	Problem Solving and Aptitude Building – II	PSAB – II
12.	Problem Solving and Aptitude Building – III	PSAB - III
13.	Problem Solving and Aptitude Building – IV	PSAB - IV

NEP-2020 Implementation Model @ SoET, AIKTC												
Sr. No	**Vertical**		**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Sub-Total**	**Total**
1	**Core / Major**	**Core Courses**	4	3	11	10	8	7	8		**51**	**67**
		Elective Courses					4	4	8		**16**	
2	**Multidisciplinary / Minor**				2	4	4	4			**14**	**14**
3	**Open Electives**					2	2	2	2		**8**	**8**
4	**VSEC**	**Vocational**					2	2			**4**	**10**
		Skill Enhancement	3	3							**6**	
5	**Ability Enhancement Courses**	**AEC**	2		2						**4**	**10**
		IKS		2							**2**	
		Entrepreneurship			2						**2**	
		VEC		2							**2**	
6	**Experiential Learning**	**Internship**								12	**12**	**28**
		CEP				2					**2**	
		Co-curricular	2	2							**4**	
		Projects					1	1	2	4	**8**	
		Lifelong								2	**2**	
7	**Sciences & Engineering**	**Maths Skills**	3	3	3						**9**	**32**
		Physics Skills		4							**4**	
		Chemistry Skills	4								**4**	
		Mechanics / BEE / CE	2								**2**	
		Comm & PD		3		2	2				**7**	
		Problem Solving & Aptitude Building			2	2		2	2		**8**	
Total Credits			**20**	**22**	**22**	**22**	**23**	**22**	**22**	**18**	**171**	

Semester - III									
Course Code	**Course Name**	**Course Abbr**	**Teaching Contact Hours**			**Credits**			
			Theory	**Tutorial**	**Practical**	**Theory**	**Tutorial**	**Practical**	**Total**
ECESEC301	Statistical Maths	SM	3	-	-	3	-	-	3
ECEPCC301	Electrical Machine	EM	3	-	-	3	-	-	3
ECEPCC302	Data Structure & Algorithms	DSA	3	-	-	3	-	-	3
ECEPCC303	Database Management System	DBMS	2	-	-	2	-	-	2
ECEMDC301	Multidisciplinary Minor Course I	MDC-1	2	-	-	2	-	-	2
AE302X	Modern Language	ML	2	-	-	2	-	-	2
ECEPCL301	Electrical Machine Lab	EM-L	-	-	2	-	-	1	1
ECEPCL302	Data Structure & Algorithm Lab	DSA-L	-	-	2	-	-	1	1
ECEPCL303	Database Management System Lab	DBMS-L	-	-	2	-	-	1	1
ECESEC302	Problem Solving and Aptitude Building - I	PSAB-I	2	-	-	2	-	-	2
AE303	Entrepreneurship Development and Design Thinking	ED&DT	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**	
ECESEC301	Statistical Maths	SM	20	30	50	-	100
ECEPCC301	Electrical Machine	EM	20	30	50	-	100
ECEPCC302	Data Structure & Algorithms	DSA	20	30	50	-	100
ECEPCC303	Database Management System	DBMS	20	20	40	-	80
ECEMDC301X	Multidisciplinary Course I	MDC-1	20	20	40	-	80
AE302X	Modern Language	ML	50	-	-	-	50
ECEPCL301	Electrical Machine Lab	EM-L	25	-	-	25	50
ECEPCL302	Data Structure & Algorithm Lab	DSA-L	25	-	-	25	50
ECEPCL303	Database Management System Lab	DBMS-L	25	-	-	25	50
ECESEC302	Problem Solving and Aptitude Building - I	PSAB-I	50	-	-	-	50
AE303	Entrepreneurship Development & Design Thinking	ED&DT	50	-	-	-	50
TOTAL			**455**		**305**		**760**

Exam Evaluation Scheme:

End Semester Exam:

The **End Semester Examination (ESE)** is conducted at the end of the academic term to assess the overall understanding, analytical ability, and application of concepts learned during the course. The examination generally consists of descriptive, analytical, numerical, and/or objective questions based on the course outcomes and syllabus coverage.

Typical Evaluation Components

- **Theory Examination:** Written exam conducted at the end of the semester.
- **Duration:** Usually 1 and a half to 2 hours.
- **Weightage:** Covering all CO's of the entire syllabus.

Continuous Internal Assessment (CIA):

<table>
<tr><td rowspan="3">Theory Course
(CIA Rubric)</td><td>Activity (Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions)</td><td>Online Quiz / Open Book Test / Class Test / Multiple Choice Question / Assignment</td><td>Attendance</td><td rowspan="2">Total</td></tr>
<tr><td>Minimum Two (02) of the above-mentioned activities each of 10 marks have to be conducted. The average marks would be considered.</td><td>Minimum Two (02) of the above-mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.</td><td>As per the rubric provided by the Attendance committee.</td></tr>
<tr><td>10</td><td>5</td><td>5</td><td>20</td></tr>
</table>

SEMESTER - III SCIENCES & ENGINEERING COURSES

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ECESEC301	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)	**CO2**	**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	**CO3**	**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, "*Higher Engineering Mathematics*", Khanna Publications, 4nd Edition
Reference Books:	
1	H. K. Das, "*Advanced Engineering Mathematics*", S. Chand, 28th Edition
2	Erwin Kreysizg, "*Advanced Engineering Mathematics*", John Wiley & Sons, 10th 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
ECEPCC301	Electrical Machine	3	0	0	3	0	0	3
		Evaluation Scheme						
		Component		CIA	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**		**CO1**	**L2**	**5**
	1.1	Principle, Energy stored in magnetic field,			
	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**		**CO2**	**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**		**CO3**	**L3**	**5**
	3.1	Retardation test, Brake test, load test, Swinburne test,			
4	**SINGLE PHASE TRANSFORMER**		**CO4**	**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**		**CO5**	**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
ECEPCC302	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**			**L3,4,5**	**7**

	5.1	Introduction to Searching: Linear search, Binary search	CO 5		
	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		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. Necaise
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
ECEPCC303	Database Management System	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		CIA	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		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
ECEPCL301	Electrical Machine Lab	0	0	2	0	0	1	1
		Evaluation Scheme						
		Component		CIA	MSE		ESE (ORAL)	Total
		Laboratory		25	-		25	50

Prerequisite: **Familiarity with Lab Equipment:** Multimeters, tachometers, wattmeter's, and variac. **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.	CO1	**L3**	**2**
5	Retardation test of DC motor.	CO1	**L3**	**2**
6	Swinburne's test on DC motors.	CO1	**L3**	**2**
7	Study of transformer connections.	CO3	**L3**	**2**
8	Open circuit and short circuit test on single phase transformer and find equivalent circuit parameters.	CO4	**L3**	**2**
9	Open circuit and short circuit test on three phase transformer and find equivalent circuit parameters.	CO4	**L3**	**2**
10	Load test on single-phase transformer	CO4	**L3**	**2**
11	Simulation of Starting method of DC Motor	CO2	**L3**	**2**
12	Simulation of Any Braking Method for DC Motor.	CO2	**L3**	**2**
13	Simulation of speed control method of DC Motor.	CO2	**L3**	**2**

SEMESTER ASSESSMENT

Total 10 Experiments need to be completed.

1. **Continuous Internal Assessment – (25 Marks)**

   1.1 Internal Practical Exam (Average of IPE-1 & IPE-2 = 15 Marks)

   Assessment 1 (IPE-1): This assessment will be conducted in the 6th week of the academics, which carries 15 marks.

   Assessment 2 (IPE-2): This assessment will be conducted in the 12th week of the academics, which carries 15 marks.

   1.2 Activity: - (3 marks)

   1.3 Experiment Performance (5 Marks)

   1.4 Attendance: 2 marks

2. **End Semester Examination (25 Marks)**

   An External Oral exam will be held based on the above syllabus.

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 (PRAC & ORAL)		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**

SEMESTER ASSESSMENT

Total 10 Experiments need to be completed.

1. **Continuous Internal Assessment – (25 Marks)**

   1.1 Internal Practical Exam (Average of IPE-1 & IPE-2 = 15 Marks)

   Assessment 1 (IPE-1): This assessment will be conducted in the 6th week of the academics, which carries 15 marks.

   Assessment 2 (IPE-2): This assessment will be conducted in the 12th week of the academics, which carries 15 marks.

   1.2 Activity: - (3 marks)

   1.3 Experiment Performance (5 Marks)

   1.4 Attendance: 2 marks

2. **End Semester Examination (25 Marks)**

An External Practical & Oral exam will be held based on the above syllabus.

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. Necaise
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

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 (PRAC & ORAL)	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	CO 2	L2	**2**

	on SQL			
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**

SEMESTER ASSESSMENT

Total 10 Experiments need to be completed.

1. **Continuous Internal Assessment – (25 Marks)**

   1.1 Internal Practical Exam (Average of IPE-1 & IPE-2 = 15 Marks)

   Assessment 1 (IPE-1): This assessment will be conducted in the 6th week of the academics, which carries 15 marks.

   Assessment 2 (IPE-2): This assessment will be conducted in the 12th week of the academics, which carries 15 marks.

   1.2 Activity: - (3 marks)

   1.3 Experiment Performance (5 Marks)

   1.4 Attendance: 2 marks

2. **End Semester Examination (25 Marks)**

   An External Practical & Oral exam will be held based on the above syllabus.

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

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 SCIENCES & ENGINEERING COURSE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ECESEC302	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	**CO2**	**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	**CO3**	**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	**CO4, CO5**	**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.

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	Arahant'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
AE303	Entrepreneurship Development & Design Thinking	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		CIA	MSE		ESE	Total
		Theory		50	-		-	50

Prerequisite: The course on Design Thinking and Entrepreneurship Development generally does not require highly specialized prior knowledge; however, the following prerequisites help students understand and apply the concepts effectively:

1. Basic understanding of Management Concept
2. Creative and analytical thinking ability
3. Communication skills
4. Problem-solving orientation
5. Fundamental knowledge of technology and society
6. Teamwork and collaboration skills
7. Basic digital literacy

Academic Prerequisites:

Completion of higher secondary education or a Diploma in any discipline.

Attitudinal Prerequisites:

Students should ideally possess:

1. Entrepreneurial mindset
2. Openness to innovation
3. Adaptability
4. Risk-taking attitude

Willingness to learn continuously

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 introduce the concepts of design thinking and entrepreneurial mindset.
2. To develop creativity, innovation, and problem-solving abilities.
3. To understand entrepreneurship development processes and business opportunities.
4. To equip learners with skills for business model creation and startup planning.
5. To encourage sustainable and socially responsible innovation.

Course Outcomes (COs):

CO1	**Explain the fundamentals of design thinking and entrepreneurship.**
CO2	**Apply creativity and ideation tools to identify business opportunities and solve problems.**

CO3	**Analyze user needs and develop prototypes using the design thinking process**
CO4	**Evaluate business opportunities and prepare viable business plans.**
CO5	**Create innovative and sustainable entrepreneurial solutions considering ethics and IPR aspects.**

Module	Detailed Contents		CO Mapped	BL	Hrs
1	**Introduction to Design Thinking and Entrepreneurship**		CO1	**L2, L3**	6
	1.1	Meaning and importance of Design Thinking		L2	
	1.2	Stages of Design Thinking: Empathize, Define, Ideate, Prototype, Test		L2	
	1.3	Concepts of Innovation and Creativity		L2	
	1.4	Entrepreneurship: Meaning, characteristics, and types		L2	
	1.5	Role of entrepreneurs in economic development		L3	
2	**Creativity, Ideation and Opportunity Identification**		CO2	**L3, L4, L5**	6
	2.1	Creativity techniques and innovation tools		L3	
	2.2	Brainstorming, SCAMPER, Mind Mapping and Lateral Thinking		L3	
	2.3	Problem identification and customer pain points		L4	
	2.4	Opportunity recognition and feasibility analysis		L4	
	2.5	Idea screening and evaluation methods		L5	
3	**Design Thinking Process and Prototype Development**		C03	**L4, L5, L6**	6
	3.1	Empathy mapping and user research		L4	
	3.2	Defining problem statements		L4	

	3.3	Ideation techniques and concept generation		L5	
	3.4	Prototype development methods		L6	
	3.5	Testing, feedback and iterative improvement		L6	
4	**Entrepreneurship Development and Business Planning**			**L2, L3, L4, L6**	
	4.1	Startup ecosystem and support institutions	CO4	L2	6
	4.2	Business Model Canvas		L3	
	4.3	Market analysis and value proposition		L4	
	4.4	Sources of finance and venture capital		L3	
	4.5	Preparation of business plan/project report		L6	
5	**Innovation Management and Sustainable Entrepreneurship**			**L3, L4, L5, L6**	
	5.1	Innovation management strategies	CO5	L5	6
	5.2	Digital entrepreneurship and emerging technologies		L4	
	5.3	Social entrepreneurship and sustainable business models		L6	
	5.4	Intellectual Property Rights (IPR) and patents		L3	
	5.5	Ethics and challenges in entrepreneurship		L5	

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

MODERN LANAGUAGE (SELECT ANY ONE)

FUNCTIONAL ARABIC

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25AE302X	Functional Arabic	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		CIA	MSE		ESE	Total
		Theory		50	-		-	50

Prerequisite: Basic understanding of language	
Course Objectives: **1. Introduce Arabic script, basic vocabulary, and sentence construction.** **2. Enable practical usage of Arabic in formal and informal settings.** **3. Teach basic Arabic grammar (nahw) and morphology (sarf).** **4. Enable reading and comprehension of simple verses.** **5. Promote confidence in listening, speaking, reading, and writing Arabic.**	
Course Outcomes (COs):	
CO1	**Recall and write Arabic alphabets, vocabulary, and simple phrases. L1**
CO2	**Understand and explain grammar concepts like sentence types and noun–verb agreement**
CO3	**Apply verb conjugations and construct grammatically sound sentences**
CO4	**Analyze Qur'anic texts for grammar and vocabulary**
CO5	**Use Arabic in functional communication situations like greeting, asking, describing**

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	Arabic Script and Basic Vocabulary		CO1	L3	4
	1.1	Alphabets, short vowels (harakat)			
	1.2	Joining letters, basic nouns, pronouns			
2	Basic Grammar and Sentence Formation		CO2	L3	6

	2.1	Nominal/verbal sentences, demonstratives,			
	2.2	prepositions, noun-adjective agreement			
3	Verb Conjugation and Morphology (Sarf)		**CO3**	**L3**	**6**
	3.1	Past/present tense,			
	3.2	Root patterns (forms I–IV),			
	3.3	Subject–verb agreement			
4	Advanced Grammar and Text Analysis		**CO4**	**L4**	**6**
	4.1	Dual/plural forms			
	4.2	case endings, particles (إنّ، كان، لعلّ), passive voice			
5	Functional Usage and Integration		**CO5**	**L3/L4**	**8**
	5.1	Functional expressions,			
	5.2	Greetings, dialogues, basic sentence analysis			

Text Books:	
1	***Durus al-Lughah al-'Arabiyyah (Madina Books 1, 2, 3)***
Reference Books:	
1	*"Al-Kitaab fii Ta'allum al-'Arabiyya" Series*
2	*"A New Arabic Grammar of the Written Language"*

MARATHI LANGUAGE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25AE302X	Marathi	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		CIA	MSE		ESE	Total
		Theory		50	-		-	50

Prerequisite: • शालेय मराठी शिक्षण (इयत्ता 10 पर्यंत)
• देवनागरी लिपी वाचता व लिहिता येणे आवश्यक

Course Objectives:

- भाषिक कौशल्य वाढवणे – विद्यार्थींचे वाचन, लेखन, ऐकणे व बोलणे या चारही भाषा कौशल्यांचा विकास करणे.
- औपचारिक व तांत्रिक मराठी लेखनाची ओळख – कार्यालयीन पत्र, अहवाल, अर्ज इत्यादींच्या माध्यमातून.
- मराठी साहित्याची मूलभूत समज विकसित करणे – कथा, कविता व लघुनाट्य वाचनातून.
- भाषांतर कौशल्ये विकसित करणे – इंग्रजी ते मराठी आणि मराठी ते इंग्रजी या दोन्ही दिशेने.
- तांत्रिक शब्दसंपत्तीची ओळख – अभियंता क्षेत्रातील तांत्रिक मराठी शब्दसंपत्ती समजून घेणे.

Course Outcomes (COs): कोर्सच्या शेवटी विद्यार्थी :

CO1	शुद्ध व सुसंगत मराठी वाचन आणि लेखन करता येईल
CO2	कार्यालयीन व तांत्रिक मराठीत पत्र व अहवाल लिहिता येतील
CO3	मराठी साहित्याचा आस्वाद घेता येईल व त्यातून नैतिक/सामाजिक विचार करता येतील
CO4	इंग्रजी-मराठी भाषांतराचे प्राथमिक कौशल्य आत्मसात होतील
CO5	अभियंता क्षेत्रात वापरली जाणारी तांत्रिक मराठी समजून घेता येईल

Module No.		Detailed Contents	CO Mapped	BL	Hrs
1	1.1	**मराठी भाषेची रचना व व्याकरण** • वर्णमाला, उच्चार व लेखन • शब्दभेद (नाम, सर्वनाम, क्रियापद, विशेषण)	CO1	L2	04
	1.2	• वाक्यरचना व वाक्यप्रकार • संधी व समास (उदाहरणांसह)			
	1.3	• काळ, लिंग, वचन, कारके, शुद्धलेखन नियम			

2	2.1	**व्यवहारातील मराठी व संवाद कौशल्य** • अभिवादन, ओळख, सौजन्यपूर्ण संवाद • औपचारिक व अनौपचारिक भाषा	**CO2**	**L2, L3**	**06**
	2.2	• दैनंदिन व्यवहारातील संवाद (बसस्टँड, बँक, महाविद्यालय) • मुलाखत संवाद, चर्चासत्र संवाद			
	2.3	• प्रास्ताविक व आभार प्रदर्शन लेखन			
3	3.1	**लेखन कौशल्य विकास** • निबंध लेखन: सामाजिक, शैक्षणिक व तांत्रिक विषयांवर	**CO3**	**L2, L3**	**04**
	3.2	• पत्रलेखन: औपचारिक (अर्ज, तक्रार, विनंती) व अनौपचारिक • अहवाल लेखन (Project report, field visit report)			
	3.3	• परिचय व आत्मचरित्र लेखन • रोजनिशी / अनुभवनिवेदन			
4	4.1	**मराठी साहित्याची ओळख** • कथा: पु.ल. देशपांडे, व.पु. काळे यांच्या लघुकथा • कविता: कुसुमाग्रज, बहिणाबाई, ग्रेस यांच्या निवडक कविता	**CO4**	**L2, L3**	**06**
	4.2	• लघुनाट्य: विनोदी किंवा सामाजिक लघुनाट्य वाचन			
	4.3	• समीक्षा लेखन: वाचलेल्या साहित्यावर चिंतन			
5	5.1	**षांतर व तांत्रिक शब्दसंपत्ती** • इंग्रजी ते मराठी आणि मराठी ते इंग्रजी भाषांतर	**CO5**	**L2, L3**	**06**
	5.2	• संवादांचे भाषांतर • अनुच्छेदांचे भाषांतर			
	5.3	• शब्दसंग्रह (Glossary): संगणक, इलेक्ट्रॉनिक्स, यांत्रिकी, नागरी अभियांत्रिकी • तांत्रिक माहितीपत्रकांचे वाचन व भाषांतर			
6	6.1	**मराठी भाषा – प्रसार, माध्यम व डिजिटल वापर** • वर्तमानपत्रातील मराठी: संपादकीय, लेख, बातम्या • सोशल मीडियावर मराठीचा वापर	**CO6**	**L2**	**04**
	6.2	• शासकीय कार्यालयीन वापरातील मराठी • भाषेचा व्यावसायिक व व्यावहारिक उपयोग			

Text Books:	
1	"व्यवसायोपयोगी मराठी" – डॉ. मधुकर चव्हाण, Publisher: लोकवाङ्मय गृह
2	"सोपं मराठी व्याकरण व लेखनकला" – प्रा. सुधीर सु. जाधव, Publisher: मेहता पब्लिकेशन
3	"भाषांतर व व्यवहार मराठी" – डॉ. अशोक गोडबोले, Publisher: ग्रंथाली
Reference Books:	
1	"मराठी भाषा आणि व्यवहार" – डॉ. रघुनाथ कुळकर्णी
2	"साहित्यदृष्ट्या निवडक मराठी कथा व कविता" – संपादक मंडळ
3	"शब्दसंग्रह – अभियांत्रिकी मराठी" – तांत्रिक मराठी समिती

GERMAN LANGUAGE

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25AE302X	German	2	0	0	2	0	0	2
		Evaluation Scheme						
		Component		CIA	MSE		ESE	Total
		Theory		50	-		-	50

Rationale:

Acquiring Mastery in the German A1 level is the first step towards fluency in the German language. This level is designed for beginners who have little to no prior knowledge of the language. It follows the CEFR (Common European Framework of Reference for Languages) and helps learners develop basic communication skills. Proficiency in the German language is valuable for international career opportunities.

Prerequisite: NIL

Course Objectives: The Learners should be able to

1. Understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of concrete needs.
2. Gain foundational understanding of German grammar, including sentence formation, verb conjugation.
3. Comprehend simple spoken and written texts related to daily life.
4. Engage in simple conversations in German using basic vocabulary and sentence structures.

Course Outcomes (COs):

CO1	Identify and use basic vocabulary in expressing oneself orally in German.
CO2	Apply foundational grammar concepts to construct and understand simple sentences.
CO3	Demonstrate basic speaking and listening skills by participating in simple conversations.
CO4	Interpret meaning from short texts and respond appropriately about day-to-day activities.

Module No.	Detailed Contents	CO Mapped	BL	Hrs
1	VOCABULARY	CO1	L3	6
	Introductions and Personal Information: Name, age, nationality, profession.			
	Family and Relationships: Basic family terms like Mutter (mother), Vater (father), Bruder (brother), etc.			
	Everyday Activities: Shopping, dining, traveling, and hobbies.			
	Numbers and Time: Telling the time, days of the week, months, seasons.			
	Common Adjectives and Adverbs: Colors, sizes, and descriptions.			
2	**GRAMMAR:**	CO2	L3	8
	Nouns and Articles: Differentiating between definite (der, die, das) and indefinite (ein, eine) articles.			
	Pronouns: Personal pronouns like ich (I), du (you), er / sie / es (he / she / it), and possessive pronouns.			
	Verb Conjugation: Regular and irregular verbs in the present tense, including sein (to be) and haben (to have).			
	Sentence Structure: Subject-verb-object order and basic questions.			
	Prepositions: Usage of prepositions such as in, auf, unter.			
	Negation: Using nicht and kein to negate sentences.			
3	**SPEAKING & LISTENING SKILLS:**	CO3	L3	3
	Understanding simple conversations about familiar topics.			
	Practicing greetings, introductions, and polite expressions.			
	Participating in role-play exercises for daily scenarios like ordering food or asking for directions.			
4	**READING & WRITING:**	CO4	L3	4

	Reading exercises: • Reading advertisements, notices, or emails. • Identifying main ideas and keywords in a text. • Following simple instructions.			
	Writing exercises: • Writing about oneself, such as hobbies, family, or daily routine. • Filling out forms with personal information. • Composing brief messages or emails.			
	Reading comprehension and basic writing: • **Reading Short Texts** – Emails, signs, menus, invitations • **Writing Simple Sentences** – Mein Name ist Anna. Ich wohne in Berlin. • **Filling Forms** – Name, Adresse, Geburtsdatum			

Text Books:	
1	*Netzwerk A1 Textbook for German* by Stefanie Dengler: Klett Publication
2	*Maximal A1 Textbook + Workbook* by Giorgio Motta, Elzbieta Krulak Kempisty & Dagmar Gluck claudia Brass: Goyal Publisher
Reference Books:	
1	*A first book in German* by H C G Brandt: Alpha Edition
2	*Netzwerk Deutsch als Fremdsprache A1* (Textbook + Workbook + Glossar) by Helen Schmitz Stefanie Dengler & Paul Rusch: BlueNBells Publication
3	*Let's Learn German A1* by Gourav Vivek Kulkarni: Notion Press
4	*Fit Fur Goethe - Zertifikat A1 (Start Deutsch 1) – German* by Johannes Gerbes & Frauke Van Der Werff: Hueber Publication
5	*Mit Erfolg Zum Goethe - Zertifikat A1 Fit in Deutsch 1* by Uta Loumiotis: Goyal Publishers