Loyola-ICAM

College of Engineering and Technology (LICET)

(Autonomous)

Loyola Campus, Nungambakkam, Chennai – 600 034

Curriculum and Syllabi (R-2024)

B.Tech. Artificial Intelligence and Data Science

Loyola-ICAM
College of Engineering and Technology (LICET)
(Autonomous)

CURRICULUM AND SYLLABI (R-2024)

CHOICE BASED CREDIT SYSTEM (CBCS)

B.Tech. Artificial Intelligence and Data Science

Vision of the Institution:

- To form responsible engineers, who would engineer a just society.

Mission of the Institution:

- To provide technical education in a Christian atmosphere to deserving students who are economically poor and socially marginalized
- To train young men and women of quality to be leaders in all walks of life and serve their fellow men with justice, truth and love
- To implement teaching learning processes that ensure guidance and mentoring for students throughout their period of study
- To provide higher education through academic collaboration and pursue research in international perspective of Engineering.

Vision of the Department:

- To form innovative AI and data science experts who address real-world and societal challenges through a collaborative and interdisciplinary approach.

Mission of the Department:

M1 : To develop innovative AI and data science professionals by equipping students with hands-on experience and practical skills through interdisciplinary projects and industry partnerships

M2 : To foster a culture of continuous learning in students, adapting to evolving technologies and emerging trends.

M3 : To provide students with a robust foundation in computing fundamentals while specializing in Artificial Intelligence and Data Science

Programme Educational Objectives:

PEO1 : Graduates will have successful careers and demonstrate technical competence in artificial intelligence and data science, contributing effectively to their respective fields.

PEO2 : Graduates will engage in lifelong learning and professional development, staying current with emerging technologies and evolving industry standards.

PEO3 : Graduates will develop strong leadership and collaboration skills, prioritizing ethical values and addressing societal needs through responsible and impactful AI and data science practices.

Programme Outcomes:

PO 1 – Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.

PO 2 – Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences**.**

PO 3 – Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations

PO 4 – Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5 – Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 6 – The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7 – Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.

PO 8 – Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

PO 9 – Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10 – Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11 – Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12 – Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes:

PSO1 : Apply mathematical, statistical analysis and engineering concepts to conduct comprehensive data analysis, enabling informed decision making and optimizing the training and refining of AI models

PSO2 : Implement algorithms and concepts to develop and enhance AI models, addressing the real-world challenges across different fields and create solutions through innovative approaches

PSO3 : Strengthen foundational computing skills and knowledge to ensure comprehensive technical proficiency and support advanced capabilities in AI and Data Science

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CURRICULUM AND SYLLABI (R-2024)
CHOICE BASED CREDIT SYSTEM (CBCS)
B.Tech. Artificial Intelligence and Data Science

SEMESTER – I

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	MA24101	Calculus for Engineers	BSC	3	1	0	4	4
2	BE24101	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
3	CY24101	Applied Chemistry	BSC	3	0	0	3	3
4	HS24101	English for Professional Communication	HSMC	3	0	0	3	3
5	GE24101	Heritage of Tamils / தமிழர் மரபு	HSMC	1	0	0	1	1
LABORATORY INTEGRATED THEORY COURSES								
6	GE24112	Problem Solving using Python	ESC	2	0	4	6	4
LABORATORY COURSES								
7	CY24121	Engineering Chemistry Laboratory	BSC	0	0	2	2	1
8	GE24121	Engineering Practices Laboratory – Civil and Mechanical	ESC	0	0	2	2	1
FORMATION COURSES								
9	FC24101	Life Skills[$]	HSMC	2	0	0	2	1
			TOTAL	17	1	8	26	21

[$]Skill based courses

SEMESTER – II

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	MA24204	Probability and Statistics	BSC	3	1	0	4	4
2	AD24201	C and Elementary Data Structures	PCC	3	0	0	3	3
3	PH24201	Physics for Information Science	BSC	3	0	0	3	3
4	GE24201	Tamils and Technology/ தமிழரும் தொழில்நுட்பமும்	HSMC	1	0	0	1	1
LABORATORY INTEGRATED THEORY COURSES								
5	GE24111	Engineering Graphics	ESC	2	0	4	6	4
LABORATORY COURSES								
6	AD24221	C and Elementary Data Structures Laboratory	PCC	0	0	4	4	2
7	GE24122	Engineering Practices Laboratory – Electrical and Electronics	ESC	0	0	2	2	1
8	PH24121	Physics Laboratory	BSC	0	0	2	2	1
FORMATION COURSES								
9	GE24123	Design Thinking[$]	HSMC	0	0	2	2	1
10	FC24102	Cultural Identities and Globalization	HSMC	2	0	0	2	0
			TOTAL	14	1	14	29	20

[$]Skill based courses

SEMESTER – III

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	MA24301	Discrete Mathematics	BSC	3	1	0	4	4
2	AD24301	Artificial Intelligence	PCC	3	0	0	3	3
3	AD24302	Non-Linear Data Structures and Algorithms	PCC	3	0	0	3	3
4	BS24301	Environmental Science and Sustainability	BSC	3	0	0	3	3
LABORATORY INTEGRATED THEORY COURSES								
5	AD24311	Database Design and Management	PCC	2	0	4	6	4
6	CS24312	Object Oriented Programming in JAVA	PCC	2	0	4	6	4
LABORATORY COURSES								
7	AD24321	Artificial Intelligence Laboratory	PCC	0	0	3	3	1.5
8	AD24322	Non-Linear Data Structures and Algorithms Laboratory	PCC	0	0	3	3	1.5
FORMATION COURSES								
9	BS24321	System Discovery and Analysis	BSC	0	0	2	2	0
			TOTAL	16	1	16	33	24

SEMESTER – IV

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	MA24403	Transforms and Linear Algebra	BSC	3	1	0	4	4
2	AD24401	Machine Learning	PCC	3	0	0	3	3
3	CS24401	Operating Systems	PCC	3	0	0	3	3
LABORATORY INTEGRATED THEORY COURSES								
4	AD24411	Data Engineering	PCC	3	0	2	5	4
5	CS24311	Digital Principles and Computer Organisation	ESC	3	0	2	5	4
LABORATORY COURSES								
6	AD24421	Machine Learning Laboratory	PCC	0	0	3	3	1.5
7	CS24421	Operating Systems Laboratory	PCC	0	0	3	3	1.5
FORMATION COURSES								
8	AD24422	Project Driven Learning[$]	EEC	0	0	2	2	1
9	FC24301	Soft Skills[$]	HSMC	2	0	0	2	1
10	HS24321	Communication Skills Building Laboratory[$]	HSMC	0	0	2	2	1
			TOTAL	17	1	14	32	24

[$]Skill based courses

Foreign language course to be completed by the end of IV semester

SEMESTER – V

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	AD24501	Big Data Analytics	PCC	3	0	0	3	3
2	AD24502	Neural Networks and Deep Learning	PCC	3	0	0	3	3
3	GE24501	Project Management and Operations Management	HSMC	2	0	0	2	2
LABORATORY INTEGRATED THEORY COURSES								
4	AD24412	Data Visualization and Story Telling	PCC	3	0	2	5	4
5	CS24512	Computer Networks	PCC	3	0	2	5	4
6		Professional Elective – 1	PEC	2	0	2	4	3
LABORATORY COURSES								
7	AD24521	Big Data Analytics Lab	PCC	0	0	3	3	1.5
8	AD24522	Deep Learning Lab	PCC	0	0	3	3	1.5
FORMATION COURSES								
9	BS24502	Logical Reasoning and Aptitude Training	BSC	2	0	0	2	1[#]
10	FC24501	Universal Human Values and Service Learning[$]	HSMC	1	0	1[*]	1	1
			TOTAL	19	0	12	31	23

[$]Skill based courses

*Activities on non-working days/hours

Not included for GPA calculation

SEMESTER – VI

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1	GE24502	Entrepreneurship and International Business Market	HSMC	2	0	0	2	2
LABORATORY INTEGRATED THEORY COURSES								
2	CS24611	Distributed and Cloud Computing	PCC	3	0	2	5	4
3		Professional Elective – 2	PEC	2	0	2	4	3
4		Professional Elective – 3	PEC	2	0	2	4	3
5		Professional Elective – 4	PEC	2	0	2	4	3
6		Open Elective – 1	OEC	-	-	-	-	3
FORMATION COURSES								
7	GE24621	Interdisciplinary Project[$]	EEC	0	0	2	2	1
8	GE24622	Problem Solving Techniques	EEC	0	0	2	2	1[#]
9	GE24503	Financial Literacy	HSMC	2	0	0	2	0
			TOTAL	13	0	12	25	19

[$]Skill based courses

Not included for GPA calculation

SEMESTER – VII

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
THEORY COURSES								
1		Open Elective – 2	OEC	-	-	-	-	3
2		Open Elective – 3	OEC	-	-	-	-	3
3	GE24701	Working to Engineer a Better World	HSMC	2	0	0	2	2
4		Audit Course	HSMC	2	0	0	2	0
LABORATORY INTEGRATED THEORY COURSES								
5	AD24711	Information Security	PCC	3	0	2	5	4
6		Professional Elective – 5	PEC	2	0	2	4	3
7		Professional Elective – 6	PEC	2	0	2	4	3
LABORATORY COURSES								
8	AD24721	Professional Project – I	EEC	0	0	4	4	2
FORMATION COURSES								
9	AD24722	Internship[$]	EEC	0	0	0	0	2
			TOTAL	-	-	-	-	22

[$]Skill based courses

SEMESTER – VIII

S. No.	Course Code	Course Title	Category	Periods per week			Total Periods	Credits
				L	T	P		
LABORATORY COURSES								
1	AD24821	Professional Project – II	EEC	0	0	20	20	10
			TOTAL				20	10

MA24101	Calculus for Engineers	BSC	L	T	P	C
			3	1	0	4

Course Objectives:

- To develop the usage of matrix algebra techniques and its applications, which are essential for engineers.
- To provide the students with the rules of differentiation.
- To impart the students with the concepts of functions of several variables.
- To make the students understand various techniques of integration.
- To acquaint the students with mathematical knowledge in evaluating multiple integrals and their applications.

UNIT I TRANSFORMATIONS 12

Stretching of an elastic membrane - eigenvalues and eigenvectors of a real matrix – properties – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms - Cayley Hamilton Theorem

UNIT II DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Parametric differentiation- Maxima and Minima of functions of single variable

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Total derivative – Partial differentiation of implicit functions – Jacobians – Taylor's series – Maxima and Minima of a function of two variables - Method of Lagrangian Multipliers - Evaluating extremum of single and two variable functions.

UNIT IV INTEGRAL CALCULUS 12

Techniques of Integration: Substitution rule, Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Moments and centre of mass.

UNIT V MULTIPLE INTEGRALS 12

Double integrals in Cartesian and Polar coordinates – Area enclosed by plane curves - Change of order of integration – Change of variables in double integrals - Triple integrals in Cartesian coordinates – Volume of solids - Change of variables from Cartesian to Spherical polar coordinates and Cylindrical polar coordinates.

Total Periods: 60

Course Outcomes:

On completion of the course, the students will be able to

CO1: To identify the eigenvalues and eigenvectors of a matrix and to execute diagonalization.
CO2: Identify the limit of functions and apply the rules of differentiation to differentiate functions.
CO3: Apply differentiation to functions of several variables
CO4: Evaluate extreme values of functions
CO5: Evaluate integrals using various techniques of integration
CO6: Evaluate multiple integrals in various coordinate systems and applications of multiple integrals

Suggested Activities

- Evaluation of eigenvalues and eigenvectors using scientific tool
- Plotting and visualizing curves, and extreme values using a scientific tool
- Plotting and visualizing surfaces, and extreme values using a scientific tool
- Evaluation of line integrals using scientific tool
- Evaluation of multiple integrals using a scientific tool
- Visualizing 2D and 3D functions using GeoGebra and Desmos

Text Books:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2018.
3. James Stewart, " Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015.

References:

1. Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016.
2. Bali.N., Goyal.M. and Watkins. C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3. Jain.R.K. and Iyengar. S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5th Edition, 2016.
4. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
5. Kuldeep Singh, “Engineering Mathematics Through Applications”, 2nd Edition, Bloomsbury Academic.
6. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.
7. Amos Gilat, “MATLAB: An Introduction with Applications”, 4th Edition, John Wiley.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	-	-	-	-	-	-	2	-	2	-
CO2	3	2	1	1	2	-	-	-	-	-	-	2	-	2	-
CO3	3	2	1	1	2	-	-	-	-	-	-	2	-	2	-
CO4	3	2	1	1	2	-	-	-	-	-	-	2	-	2	-
CO5	3	2	1	1	2	-	-	-	-	-	-	2	-	2	-
CO6	3	2	1	1	2	-	-	-	-	-	-	2	-	2	-
Avg.	**3**	**2**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**

BE24101	**Basic Electrical and Electronics Engineering**	**ESC**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Objectives

- To introduce the basics of Electric Circuits and analysis.
- To impart knowledge in the basics of working principles and application of Electrical Machines.
- To introduce analog devices and their characteristics.
- To educate on the fundamental concepts of digital electronics.
- To interpret the fundamentals of Sensors.

UNIT I ELECTRICAL CIRCUITS 9

DC Circuits: Basic circuit components - Ohm's Law - Kirchhoff's Laws – Nodal Analysis, Mesh analysis - Simple problems with Independent Sources – Introduction to AC Circuits - Purely resistive, Inductive & Capacitive excited by AC Source (Qualitative Treatment Only).

UNIT II ELECTRICAL MACHINES 9

Construction, Working principle, Types and Applications: DC Motor – DC Generator - Single phase Transformers - Stepper Motor - Servo Motor (Qualitative Treatment Only).

UNIT III ANALOG ELECTRONICS 9

Construction, Operation, Characteristics and Application of PN Junction diode – Zener diode – Bipolar Junction Transistor (Common Emitter Characteristics only) – Half wave and full wave Rectifiers.

UNIT IV DIGITAL ELECTRONICS 9

Review of number systems, Binary codes, Hamming and Parity code, Combinational logic - representation of logic functions - SOP and POS forms, K-Map representations- minimization using K maps (Simple Problems with 3 variables only).

UNIT V SENSORS 9

Introduction to Sensors - Photovoltaic - LDR - Piezo electric - RTD - Principle and application of IR sensor - Ultrasonic sensor.

Total Periods:45

Course Outcomes:
On completion of the course, the students will be able to
CO1: Understand the fundamental components of DC circuits.
CO2: Compute the electric circuit parameters for simple problems.
CO3: Explain the working principle and applications of electrical machines.
CO4: Describe the characteristics of analog electronic devices.
CO5: Explicate the basic concepts of digital electronics.
CO6: Explain the principles and applications of sensors.

Text Books:

1. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
2. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020
3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008
4. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

References:

1. Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.
2. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
3. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
5. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
CO2	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
CO3	2	1	1	-	-	-	-	1	-	-	-	2	-	-	1
CO4	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
CO5	2	2	1	-	-	-	-	1	-	-	-	2	2	2	2
CO6	2	2	1	-	-	-	-	1	-	-	-	2	2	2	2
Avg.	2	1.8	1	-	-	-	-	1	-	-	-	2	2	2	1.33

CY24101 Applied Chemistry BSC L T P C

3 0 0 3

Course Objectives:

- To familiarize the water quality criteria and interpret its significance in water purification.
- To identify various boiler troubles and its treatment techniques.
- To assimilate the preparation, properties, and applications of nanomaterials in various fields.
- To illustrate the principles of electrochemical reactions in the corrosion of materials and methods for corrosion prevention and protection of materials.
- To familiarize the students with the operating principles, working processes, and applications of energy conversion and storage devices.
- To impart knowledge about the types of sensors and their applications.

UNIT I WATER TECHNOLOGY 9

Water – Sources and Impurities, Water Quality Parameters: Definition and Significance of Colour, Odour, Turbidity, pH, Hardness, Alkalinity, TDS, COD and BOD, Fluoride and Arsenic. Municipal water treatment: Screening, Sedimentation, Coagulation, Sand filtration and Disinfection (Ozonation, UV treatment, Chlorination), Desalination of brackish water: Reverse Osmosis. Boiler troubles (Scale & Sludge, Caustic embrittlement, Boiler Corrosion, Priming & Foaming). Internal Conditioning (Colloidal, Sodium Aluminate, Phosphate and Calgon Conditioning) and External Conditioning (Zeolite and Ion-Exchange Demineralization).

UNIT II NANO CHEMISTRY 9

Basics: Distinction between Molecules, Nanomaterials and Bulk materials; Size-Dependent Properties (Optical, Electrical, Mechanical, Magnetic and Catalytic). Types of Nanomaterials: Definition, Properties and Uses of - Nanoparticle, Nanocluster, Nanorod, Nanowire and Nanotube.

Preparation of Nanomaterials: Sol -Gel, Solvothermal, Laser Ablation, Chemical Vapour Deposition, Electrochemical Deposition and Electro Spinning. Applications of Nanomaterials in Medicine, Agriculture, Energy, Electronics and Catalysis.

UNIT III ELECTROCHEMISTRY AND CORROSION 9

Electrochemical Cell, Redox reaction, Electrode Potential - Oxidation and Reduction Potential. Nernst Equation and Applications. Emf Series. Introduction to Corrosion - Chemical and Electrochemical Corrosion (Galvanic Corrosion, Concentration Cell Corrosion), Galvanic Series - Factors Influencing Corrosion. Corrosion Control - Material Selection and Design - Electrochemical Protection - Sacrificial Anodic Protection and Impressed Current Cathodic Protection. Protective Coatings - Metallic Coatings (Galvanizing, Tinning), Organic Coatings (Paints). Paints: Constituents and Functions.

UNIT IV STORAGE DEVICES AND ENERGY SOURCES 9

Batteries - Characteristics - Types of Batteries – Primary Battery (Alkaline Battery), Secondary Battery (Lead Acid, Lithium - Ion - battery) - Emerging Batteries – Nickel - Metal Hydride Battery, Aluminium Air Battery, Batteries for Automobiles and Satellites - Fuel Cells (Types) – H2-O2 Fuel Cell - Super capacitors - Types and Applications, Nuclear Energy – Nuclear Fission, Fusion, Differences, Characteristics – Nuclear Chain reactions – Light Water Nuclear Reactor – Breeder Reactor. Renewable Energy: Solar energy - Solar Cells, DSSC.

UNIT V CHEMICAL SENSORS 9

Sensors, Sensor Science and Technology, Types of Sensors. Chemical Sensors – Characteristics and Elements. Electrochemical Sensors – Voltammetry, Potentiometric Sensors, Amperometric Sensors, Polarization Techniques.

Total Periods: 45

Course Outcomes:
On completion of the course, the students will be able to
CO1: Analyze the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
CO2: Explain the various boiler problems and water treatment techniques.
CO3: Apply basic concepts of Nano chemistry in designing the synthesis of nanomaterials for engineering applications.
CO4: Apply the principles of electrochemistry in corrosion control.
CO5: Analyze different forms of energy resources for suitable applications in energy sectors.
CO6: Explain the types of sensors and their applications.

Suggested Activities
- Quiz
- Mind Mapping on type of nanomaterials
- Seminar
- Animated videos on reverse osmosis, nuclear power plant
- Demonstration of water parameter analysis
- Electroplating process by group of students
- Demonstration of sensors

Text Books:

1. Jain P. C. & Monica Jain., "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi,2012.
3. Dara S.S., "A Textbook of Engineering Chemistry", Chand Publications, 2004.
4. B.K.Sharma, "Instrumental Methods of Chemical Analysis" , 28th Edition, Goel Publishing House. 2012.

References:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text Book of Nanoscience and Nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

MAPPING OF COs WITH POs AND PSOs

Cos	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	1	1	-	-	-	-	1	-	-	-
CO2	3	2	2	1	-	1	1	-	-	-	-	1	-	-	-
CO3	2	-	-	1	-	2	2	-	-	-	-	-	-	-	-
CO4	3	2	2	1	-	1	2	-	-	-	-	2	-	-	-
CO5	3	1	2	1	-	2	2	-	-	-	-	2	-	-	-
CO6	3	1	2	1	-	2	2	-	-	-	-	2	-	-	-
Avg.	**2.8**	**1.6**	**1.7**	**1**	**-**	**1.5**	**1.7**	**-**	**-**	**-**	**-**	**1.3**	-	-	-

HS24101 English for Professional Communication HSMC L T P C

3 0 0 3

Course Objectives:

- To develop effective listening, speaking, reading, and writing skills for professional contexts.
- To cultivate formal correspondence skills for workplace communication.
- To analyze and apply rhetorical techniques in writing and speaking.
- To encourage self-expression through storytelling and reflective writing.
- To strengthen grammar and vocabulary for improved language proficiency.

UNIT I Communication basics 9

Listening - Link verbal and nonverbal cues and listen to podcasts and news stories.
Reading - Read brochures and running headlines. Social media messages and electronic correspondence relevant to professional advancement
Writing - Formal letters
Speaking - Self-introduction - Dialogues and role plays, discussing news stories, asking doubts (clarification, direction, inquiring details…)

Grammar - Noun, Pronoun, Articles
Vocabulary - one-word substitution, phrasal verbs

UNIT II Professional Correspondence 9

Listening - Listen to voicemails, presentations, and panel discussions
Reading - MoM - minutes of the meeting, memos, business and economic articles
Writing - Respond to Business Emails
Speaking - Inaugural speech, Vote of thanks, and mini-presentation
Grammar - Verb, concord, wh questions, and Yes/no, question tag
Vocabulary - Word forms (Prefix & suffix)

UNIT III Rhetoric Communication 9

Listening - Monologue from plays and movies, and sale pitches (marketing and promotions)
Reading - Looking for ambiguity - Ethos, pathos, and logos (poem or play)
Writing - Essays - problem solution, cause and effect essay
Speaking - Deliver a monologue - situational scenarios
Grammar - Conjunctions, prepositions, interjections
Vocabulary - Discourse markers for contextual essays, idioms, and phrases

UNIT IV Extended narration 9

Listening - Listen to documentaries, debates, discussions, and Toastmasters speech
Reading - Read professional resumes, LinkedIn profiles, newsletter
Writing - Blog writing, writing reviews
Speaking - Debate, group discussion
Grammar - Mixed tenses, Adverb
Vocabulary - Compound words, Collocation

UNIT V Language and self 9

Listening - Listen to tone, mood, and attitude. Find meanings based on the context, and listen to different accents.
Reading - An excerpt from an autobiography
Writing - Reflective journal and diary entries
Speaking - Narrate stories from personal experience
Grammar - Adjective, direct, and indirect speech
Vocabulary - Contextual meaning of words, Abbreviations, and acronyms

Total Periods: 45

Course Outcomes:
On completion of the course, the students will be able to
CO1: Demonstrate enhanced listening, speaking, reading, and writing skills tailored for professional environments.
CO2: Compose clear formal emails and letters for workplace communication.
CO3: Analyze and use rhetorical techniques to engage and persuade audiences.
CO4: Develop storytelling and reflective writing skills to share personal experiences.
CO5: Improve grammar and vocabulary for effective communication.
CO6: Foster teamwork and discussion abilities through debates and group presentations.

Suggested Activities

- Take a set of 15 messages and classify them into spam, alerts, scams, discount texts, news, cautionary, personnel, and informative.

- Reflective journal - write your own personal and learning experience so far at LICET. Page limit: 3 pages.
- Rhetoric Writing - Find a product or create a product and employ ethos, pathos, and logos to persuade the customers to buy your product. Write in 250 words.
- Creative writing - Create your account on Blogger and write reviews, articles, and stories.

Text Books:

1. English for Engineers and Technologists. Volume I by Orient Blackswan, 2022
2. English for Science & Technology - I by Cambridge University Press, 2023

References:

1. Interchange. Cambridge University Press. USA, 2022.
2. Embark. Cambridge University Press. USA, 2016.
3. A course in Technical English. Cambridge University Press. USA, 2023.
4. High School English Grammar & Composition. Wren & Martin's Regular & Multicolour Edition. S.Chand Publishing, 2016.
5. Interchange by Jack C. Richards, Fifth Edition, Cambridge University Press, 2017.
6. English for Academic Correspondence and Socializing. Adrian Wallwork, Springer, 2011.
7. The Study Skills Handbook. Stella Cortrell, Red Globe Press, 2019
8. www.uefap.com

MAPPING OF COs WITH POs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	1	3	-	-	2	3	-	3	-	-	-
CO2	-	-	-	1	1	3	-	-	2	3	-	3	-	-	-
CO3	-	-	-	1	1	3	1	-	3	3	1	3	-	-	-
CO4	-	-	-	1	1	3	2	1	1	1	2	3	-	-	-
CO5	-	-	-	1	1	3	1	-	2	3	-	3	-	-	-
CO6	-	-	-	1	1	3	-	-	3	3	1	3	-	-	-
Avg.	-	-	-	1	1	3	1.3	1	2.1	2.6	1.3	3	-	-	-

GE24101	HERITAGE OF TAMILS	HSMC	L	T	P	C
			1	0	0	1

Course Objectives:

This course enables the students to

- provide an insight to the students into the rich culture and heritage of the state
- provide the students with detailed information on the engineering techniques to construct architectural marvels practiced in Tamil Nadu
- make the students connect with their roots, appreciate, and preserve it.

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE **3**

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS **3**

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS **3**

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE **3**

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

Total Periods:15

Course Outcomes:
On completion of the course, the students will be able to
CO1: Understand the human values and rights in Tamil literature
CO2: Learn the art and culture being practiced by the people of Tamil Nadu
CO3: Understand various games and dance practices by the people of Tamil Nadu
CO4: Understand the Tamil Culture and Customs through Folklore
CO5: Learn the concepts of Sangam Literature and the bravery of Kings
CO6: Learn the life history of freedom fighters Vedic herbs and developments in lifestyle

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

GE24101	தமிழர் மரபு	HSMC	L	T	P	C
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அலகு I மொழி மற்றும் இலக்கியம் 3

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தொல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் –

சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குக் தமிழர்களின் பங்களிப்பு **3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

Total Periods:15

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

GE24112	**Problem Solving using Python**	**ESC**	**L**	**T**	**P**	**C**
			2	**0**	**4**	**4**

Course Objectives:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To define Python functions and use function calls to solve problems.
- Learn to manage file operations, handle exceptions, and apply object-oriented programming principles in Python
- To familiarize with Python's module system, packages, and essential scientific libraries

UNIT I PROBLEM SOLVING AND INTRODUCTION TO PYTHON PROGRAMMING 7

Fundamentals of computational thinking, algorithmic problem solving and logical thinking, problem solving and decomposition, notations (pseudo code, flowchart) - Introduction to Python – Literals – Variables and Identifiers -Comments- Reserved words – Data Types - Operators and Expressions - Input and Output: Working with user input, displaying output, and formatting - Conditional if - alternative if - chained conditional - Iteration: state, while, for, break, continue, pass

UNIT II DATA STRUCTURES AND MANIPULATION 5

Lists: List operations - List slices - List methods - List loop - Mutability - Aliasing - Cloning lists - List parameters - Lists as arrays-Advanced list processing-List Comprehension- Tuples: Tuple assignment - Tuple as return value. Dictionaries: Operations and Methods- Sets: Creating Sets – Operations and methods – Set comprehension

UNIT III STRINGS AND FUNCTIONS 6

Functions - definition and use - Flow of execution - Parameters and arguments - Fruitful functions: Return values - Parameters - Local and global scope -Function composition - Recursion - Strings: string slices, immutability, string functions and methods, string module

UNIT IV FILES, EXCEPTIONS, CLASSES AND OBJECTS 6

Files and exception: Text files - Reading and writing files - Command line arguments-Errors and exceptions - Handling exceptions - Classes and Objects: Defining classes - Creating Objects Data abstraction – Class variables and Object variables – Working with objects and Methods

UNIT V MODULES AND PACKAGES 6

Introduction to Modules and Packages- Basics of NumPy - N-dimensional Array in NumPy - Methods and Properties - Basics of SciPy - Broadcasting in NumPy Array Operations - Array Indexing in NumPy, Pandas - Introduction - Series - Data Frame - Matplotlib - Basics - Figures and Axes - Method subplot - Axis container

Periods: 30

LIST OF EXPERIMENTS:

1. Identification and solving of simple real life or technical problems related to applications to specific discipline and developing algorithms/flowcharts.
2. Python programming using simple statements and expressions.
3. Solving problems using conditional statements.
4. Solving problems using iterative loops (Palindrome, Factorial, Prime Numbers).
5. Implementing real-time/technical applications using List.
6. Implementing real-time/technical applications using Tuples.
7. Implementing real-time/technical applications using Dictionaries.
8. Implementing real-time/technical applications using sets.
9. Implementing programs using functions.
10. Implementing programs using strings.
11. Implementing programs using modules.
12. Implementing programs using command line arguments
13. Implementing real-time/technical applications using file handling (Word count- longest word - Copy file).
14. Implementing real-time/technical applications using exception handling.

15. Creating and Instantiating classes (Creating student class and object, Voter's age validation, Marks range validation (0-100)).
16. Implement programs using standard libraries (Pandas, Numpy, Scipy).
17. Generating basic plots using Matplotlib.
18. Developing a game activity using Pygame

Periods: **60**

Total Periods: 90

Course Outcomes:
On completion of the course, the students will be able to
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop solutions to problems using control structures.
CO3: Process compound data using Python data structures.
CO4: Structuring python program into functions and to implement String handling functions
CO5: Read and write data from/to files in Python programs and handle exceptions
CO6: Understand object-oriented programming concepts through classes and objects.
CO7: Utilize Python modules and packages for performing data analysis.

Suggested Activities
- Developing Pseudocodes and flowcharts for real life activities such as railway ticket booking using IRCTC, admission process to undergraduate course, academic schedules during a semester etc.
- Assign a project to create a small application that uses various Python data structures (lists, tuples, dictionaries, and sets) to manage and process a dataset (e.g., a contact list or inventory system).
- Data Analysis and Visualization using NumPy, Pandas, and Matplotlib - Provide a dataset (e.g., weather data, sales records) and ask students to perform data analysis using NumPy and Pandas, followed by visualizing the results using Matplotlib.
- External Learning - Recursion vs. Iteration.
- Flipped Learning - tkinter package
- Mini-project

Text Books:
1.Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2.Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

References:
1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

Laboratory Requirements:

S.No.	Description of Equipment	Required numbers (for batch of 30 students)
1	Standalone desktops (Windows/Linux) with Python 3 interpreter	30

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	2	-	-	-	-	-	1	1	1	1	3
CO2	2	2	1	-	2	-	-	-	-	-	1	1	1	1	3
CO3	2	2	-	-	2	-	-	-	-	-	1	1	1	1	3
CO4	2	2	2	2	2	-	-	-	-	-	1	1	1	1	3
CO5	2	2	-	-	2	-	-	-	-	-	1	1	1	1	3
CO6	2	2	2	2	2	-	-	-	1	-	1	1	1	1	3
CO7	2	2	2	2	2	-	-	-	1	-	1	1	1	1	3
Avg.	2	2	2	2	2	-	-	-	1	-	1	1	1	1	3

CY24121	Engineering Chemistry Laboratory	BSC	L	T	P	C
			0	0	2	1

Course Objectives

- To inculcate experimental skills to test basic understanding of water quality parameters, such as acidity, alkalinity, hardness, DO, TDS, and Chloride.
- To demonstrate the synthesis of nanoparticles.
- To familiarize the students with the determination of the molecular weight of a polymer by a viscometer.
- To familiarize the students with electroanalytical techniques such as pH metry, Potentiometry, and Conductometry to determine impurities in aqueous solutions.
- To understand the factors influencing corrosion.

LIST OF EXPERIMENTS:(Minimum of 7 experiments to be conducted)

1. Estimation of HCl using Na2CO3 as primary standard
2. Determination of alkalinity in water sample.
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Determination of strength of given hydrochloric acid using pH meter.
8. Conductometric titration of strong acid vs strong base.
9. Estimation of iron content of the given solution using potentiometer.
10. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
11. Estimation of sodium and potassium present in water using a flame photometer.
12. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
13. Preparation of nanoparticles (TiO2/ZnO/CuO) by Sol-Gel method.
14. Corrosion experiment-weight loss method.
15. Conductometric titration of barium chloride Vs Sodium Sulphate - Precipitation method.

Total Periods: 30

Course Outcomes:
On completion of the course, the students will be able to
CO1: Analyze the quality of water samples with respect to their acidity, alkalinity.
CO2: Determine the hardness and chloride content of the water sample.
CO3: Demonstrate precipitation method for synthesis of nanoparticles.
CO4: Determine the molecular weight of the polymer.
CO5: Estimate the amount of analyte by conductometry.
CO6: Quantitatively analyze the impurities in solution by electroanalytical techniques.

References:
1. Engineering Chemistry Laboratory Manual – Department of SH-Chemistry, LICET, 2024.
2. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

Laboratory Requirements:
1.Conductivity meter – 15 Nos.
2. pH meter - 15 Nos.
3. Potentiometer - 15 Nos.
4.Viscometer - 35 Nos.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	2	2	-	-	-	-	2	-	-	-
CO2	3	2	1	-	-	2	2	-	-	-	-	2	-	-	-
CO3	2	1	2	-	-	2	2	-	-	-	-	-	-	-	-
CO4	2	1	2	-	-	1	1	-	-	-	-	1	-	-	-
CO5	3	1	2	-	1	2	2	-	-	-	-	2	-	-	-
CO6	3	1	2	-	1	2	2	-	-	-	-	2	-	-	-
Avg.	**2.7**	**1.3**	**1.7**	**-**	**1**	**1.8**	**1.8**	**-**	**-**	**-**	**-**	**1.8**	**-**	**-**	**-**

GE24121	Engineering Practices Laboratory - Civil and Mechanical	ESC	L	T	P	C
			0	0	2	1

Course Objectives:

- Familiarize students with basic tools and equipment used in engineering.
- Develop practical skills in Mechanical, Civil and 3D Printing practices.
- Encourage teamwork and collaboration in a lab environment.
- Foster an understanding of safety protocols and procedures.

INTRODUCTION AND SAFETY PRACTICES

Overview of lab rules, expectations, and safety protocols**,** Personal Protective Equipment (PPE), handling tools and equipment safely, emergency procedures.

MECHANICAL PRACTICES

Workshop Tools: Identification and usage of basic mechanical tools (hammers, wrenches, screwdrivers, etc.). **Basic Machining:** Introduction to lathe and drilling machines. Practicing Facing, Turning, and Drilling. **Sheet Metal Works:** Making a dustpan and funnel.

CIVIL PRACTICES

Plumbing: Exposure to different plumbing components. Exposure to plumbing repair methods and troubleshooting of existing connections. Practicing pipe connection to the wash basin from the water tank. **Carpentry:** A study on carpentry procedure. Making joints like the Tee joint and the Dovetail joint. Exposure and usage of power tools.

ADDITIVE MANUFACTURING PRACTICES

Welding: Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding, CO2, gas, and MIG welding techniques. **Foundry:** Introduction to the foundry process and tools. Mold preparation for solid and split patterns. **3D Printing:** Basics of 3D printing and simple projects.

ASSEMBLING AND FITTING

Introduction to Systems - Dismantling and Assembling of Mixer/IC Engines/Refrigerator and Air Conditioner

Total Periods: 30

Course Outcomes:
On completion of the course, the students will be able
CO1: To perform basic machining operations
CO2: To perform operations on the given sheet metal
CO3: To understand the concepts of additive manufacturing methods like Welding, Moulding and 3D Printing
CO4: To understand the rudimentary concepts of refrigeration and air conditioning systems
CO5: To do basic household works like Plumbing, Carpentry Joints
CO6: To identify the components of Mixer/IC Engines/Refrigerator/AC.

Text Books:
1.Workshop Technology by W.A.J. Chapman
2.Electrical Engineering Fundamentals by Vincent Del Toro
3.Basic Civil Engineering by M.S. Palanichamy

MAPPING OF COs WITH POs AND PSOs

COs	Pos												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO3	2	-	-	-	2	-	-	-	2	-	-	-	-	-	-
CO4	2	-	-	-	1	-	-	-	2	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO6	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Avg.	1.6	-	-	-	1.5	-	-	-	2	-	-	-	-	-	-

FC24101	Life Skills	HSMC	L	T	P	C
			2	0	0	1

Course Objectives

- To enhance self-awareness and understanding of personal strengths, weaknesses, and potential.
- To develop mechanisms to navigate through emotions and stress.
- To build effective interpersonal skills and maintain healthy social relationships.
- To foster and develop strategies for holistic well-being.
- To reflect on personal growth.

UNIT I Knowing Thyself **6**

- Knowing Thyself
  - Strengths, Limitations, Characteristics, Habits and Experiences
- Sense of SELF
  - Self Awareness, Self Image, Self-esteem, Self Love, Self Respect
- Three Dimensions of SELF
  - 1) Ideal Self, 2) Social Self, and 3) Real Self
- Personality Types
  - 1) Introvert, 2) Extrovert, and 3) Ambivert

UNIT II Emotional Competence **6**

- Understanding emotions
- Understanding the patterns of thoughts, feelings, and behaviors (Cognitive Behavior Theory)
- Handling stress, anxiety, and fear (flight mode) / anger (fright mode)
- Happy chemicals (4 chemicals - Dopamine, Oxytocin, etc)
- Positive Thinking

UNIT III Interpersonal Skills **6**

- Interpersonal relationships
- Communicating Positive Expressions (Empathy, Trust, Forgiveness, Gratitude, Compassion)
- Personal and Social Associations - Family systems, Relationship management
- Building personal, social, and digital intelligence
- Sense of OTHERS
- Gender Equity

UNIT IV Dimensions of Well-being **6**

- Intellectual Well-being
- Emotional Well-being
- Spiritual Well-being
- Physical Well-being
- Social Well-being

UNIT V Life to the fullest **6**

- Happiness v/s Having fun
- Self-Retrospection and Positive Transformation
- Synthesis, Personal Reflection, and Way Forward

Total Periods: 30

Course Outcomes:
On completion of the course, the students will be able to
CO1: Identify their strengths and weaknesses and demonstrate self-awareness through reflective practices.
CO2: Demonstrate the ability to recognize emotions and handle stress.
CO3: Enhance interpersonal skills to build strong and positive relationships.
CO4: Adapt to a comprehensive understanding of well-being, and be able to implement strategies for maintaining mental health.
CO5: Develop a deeper understanding of personal and social relationships, and identify areas for growth.
CO6: Synthesize learning into a cohesive life plan for future growth.

Suggested Activities
- Cognitive behavior therapy
- PLOT
- SLOT
- SWOT
- Johari Window

References:

1. Bradberry, Travis, and Jean Greaves. *Emotional Intelligence 2.0*. TalentSmart,2009.
2. Republic of Philippines, Department of Education. *K to 12 Senior High School Core Curriculum.* - Personal Development, May 2016.
3. US Department of Education, *Career Guidance and Counselling Programs.* Rich South High School Horizon Program: (Rich Town Park Illinois: Rich South High School, 1998)

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	3	3	3	3	-	-	-	-	-
CO4	-	-	-	-	-	-	3	3	-	3	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	-	-	-	3	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
Avg.	-	-	-	-	-	-	2.8	3	3	3	-	3	-	-	-

MA24204	Probability and Statistics	BSC	L	T	P	C
			3	1	0	4

Course Objectives

- This course aims to provide the required skill to apply statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two-dimensional random variables.
- To acquaint the knowledge of testing hypotheses for small and large samples which plays an important role in real-life problems.
- To introduce the basic ANOVA techniques

UNIT I PROBABILITY AND RANDOM VARIABLES 12

Probability – The axioms of probability – Conditional probability – Total Probability - Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (without proof)

UNIT III TESTING OF HYPOTHESIS 12

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit

UNIT IV ANOVA TECHNIQUES 12

One-way and Two-way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design

UNIT V STATISTICAL QUALITY CONTROL 12

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling

Total Periods: 60

Course Outcomes:
On completion of the course, the students will be able to
CO1: To introduce the basic concepts of probability and random variables
CO2: To apply standard distributions in real-life phenomena
CO3: To introduce the concepts of two-dimensional random variables
CO4: To apply the concept of testing of hypothesis for large samples and small samples in real life problems
CO5: To apply the basic concepts ANOVA technique
CO6: To understand the concepts of statistical quality control

Suggested Activities
- Generate random variables using scientific tool
- Generate two dimensional random variables using scientific tool
- Performing Z-test using scientific tool
- Performing analysis of variance using scientific tool
- Visualizing control charts using scientific tool

Text Books:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

References:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	-	-	-	2	3	2	2
CO2	3	2	2	2	2	-	-	-	-	-	-	2	3	2	2
CO3	3	2	2	2	2	-	-	-	-	-	-	2	3	2	2
CO4	3	2	2	2	2	-	-	-	-	-	-	2	3	2	2
CO5	3	2	2	2	2	-	-	-	-	-	-	2	3	2	2
CO6	3	2	2	2	2	-	-	-	-	-	-	2	3	2	2
Avg.	**3**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**	**2**

AD24201 C and Elementary Data Structures PCC L T P C

3 0 0 3

Course Objectives:

- To develop proficiency in fundamental concepts of C programming
- To understand and apply advanced C features
- To learn the concepts of Abstract Data Types and Lists
- To comprehend stack and queue ADTs and its applications
- To implement Searching, Sorting, and Hashing Techniques

UNIT I C Programming Fundamentals 9

Introduction-Data Types – Variables – Operations – Expressions and Statements – Control Statements and Looping – Functions – Arrays – Single and Multi-Dimensional Arrays, String Manipulation

UNIT II C Programming - Advanced Features 9

Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions – File Handling –Dynamic Memory Allocation- Preprocessor Directives.

UNIT III Abstract Data Types and List 9

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial ADT

UNIT IV Stack and Queue 9

Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions – Infix to Postfix conversion – Function Calls – Queue ADT – Operations – Circular Queue – Deque – Applications of Queues.

UNIT V Searching, Sorting and Hashing Techniques 9

Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Quick Sort – Insertion sort – Shell sort – Merge Sort — Radix Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Total Periods: 45

Course Outcomes:
On completion of the course, the students will be able to
CO1: Develop C Programs for any real world/technical application.
CO2: Apply advanced features of C in solving problems.
CO3: Design and implement list ADTs.
CO4: Design, implement, and analyse queues and stacks with its applications.
CO5: Implement and appropriately use sort, search and hashing techniques for any application.
CO6: To enhance problem-solving skills and write optimized code using data structures and algorithms.

Suggested Activities
- Flipped Learning on recursion vs iteration. Program to perform the same functionality using recursion and iteration
- Flipped Learning on File Handling followed by an in-class activity where students write a program that reads data from a file using file handling functions and utilizes pointers for data processing.
- Implement Bubble Sort, Selection Sort, and Insertion Sort. Extend this by implementing Merge Sort. Compare their performance on different input sizes and patterns (e.g., sorted, reverse sorted, random).
- Develop a simple library management system where books are stored as records (structure/union) with features like adding, deleting, searching for books (using hash tables), and listing books in a sorted order (using sorting algorithms).

Test Books

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 1997.
2. ReemaThareja, “Programming in C”, Second Edition, Oxford University Press, 2016.

Reference Books

1. Brian W. Kernighan, Rob Pike, “The Practice of Programming”, Pearson Education, 1999.
2. Paul J. Deitel, Harvey Deitel, “C How to Program”, Seventh Edition, Pearson Education, 2013.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education,1983.
4. Ellis Horowitz, SartajSahni and Susan Anderson, “Fundamentals of Data Structures”, Galgotia, 2008

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	2	-	-	-	1	-	1	2	-	-	3
CO2	2	2	2	1	2	-	-	-	1	-	1	2	-	-	3
CO3	2	3	2	1	2	-	-	-	1	-	1	2	1	-	3
CO4	2	3	2	2	2	-	-	-	1	-	1	2	1	-	3
CO5	2	3	2	2	2	-	-	-	1	-	1	2	1	-	3
CO6	2	2	3	2	3	-	-	-	1	-	2	2	2	-	3
Avg.	**2**	**2.66**	**2.16**	**1.6**	**2.16**	**-**	**-**	**-**	**1**	**-**	**1**	**2**	**1.25**	**-**	**3**

PH24201	Physics for Information Science	BSC	L	T	P	C
			3	0	0	3

Course Objectives:

- To make the students understand the basics of elastic properties of matter and Thermal Physics
- To instill knowledge of oscillations and waves and make them able to apply this knowledge in engineering situations.
- To establish a sound grasp of foundational principles of quantum mechanics and enable them to perform basic quantum mechanical calculations.
- To introduce the basics principles of photonics and fibre optic communication to students
- To make students understand the applications of quantum mechanics in solid state physics to decipher the electrical properties of materials.

UNIT I PROPERTIES OF MATTER AND THERMAL PHYSICS 9

Elasticity –Hooke's law - stress-strain diagram for ductile and brittle materials – uses- Bending of beams –Bending moment - Young's modulus determination - Cantilever - uniform and non-uniform bending (Theory and experiment) - I shaped girders.
Thermal conduction in solids – Fourier's law - thermal conductivity -Thermal resistance - Determination of thermal conductivity-Lee's disc method: theory and experiment.

UNIT II OSCILLATIONS AND WAVES 9

Simple harmonic motion - Torsional pendulum – Damped oscillations –Shock Absorber -Forced oscillations and Resonance (qualitative)–Applications of resonance - Electrical analogy of mechanical oscillators - waves on a string - progressive waves - stationary waves- Energy transfer of a wave.

UNIT III QUANTUM MECHANICS 9

Black body radiation – Planck's hypothesis and black body radiation formula (qualitative)- Wave particle duality–de Broglie hypothesis– Uncertainty Principle – The Schrodinger Wave equation (time-dependent and time-independent) – Physical interpretation of wave function - Normalization - Particle in an infinite potential well - Energy values and wave functions - Quantum mechanical tunneling. Scanning tunneling microscope.

UNIT IV PHOTONICS AND FIBRE OPTICS 9

Laser – characteristics – Spontaneous and Stimulated emission-Einstein's coefficients - population inversion - Metastable states - Basic components of a laser system - CO_2 laser, Semiconductor laser - Industrial and medical applications - Optical Fibres – Total internal reflection – Numerical aperture and acceptance angle – Fibres optic communication system.

UNIT V QUANTUM THEORY OF SOLIDS 9

Electrons in metals - Classical free electron theory- quantum free electron theory Fermi- Dirac statistics – Density of energy states. Fermi energy and free electron density. Drawbacks of quantum free electron theory- Electrons in a periodic potential- Kronig-Penney Model (qualitative) -Band theory. Classification of solids based on energy band structure.

Total Periods: 45

Course Outcomes:

On completion of the course, the students will be able to

CO1: Illustrate applications of mechanical and thermal properties of materials in engineering systems.
CO2: Estimate the vibrational stability of an engineering system which employs periodic motion.
CO3: Calculate basic measurable quantities of simple quantum mechanical models.
CO4: Apply the characteristics of lasers for material processing and in the medical field.
CO5: Outline the operational principle of fiber optic communication systems.
CO6: Apply quantum mechanical principles towards the formation of energy bands.

Text Books:

1. Avadhanulu M N, Kshirsagar P G, "A Textbook of Engineering Physics", S Chand & Co Ltd, Ninth Revised Edition, 2012.
2. Hitendra K Malik, A K Singh " Engineering Physics McGraw Hill Education; Second edition (3 August 2017)
3. Gaur R K, Gupta S L, "Engineering Physics", Dhanpat Rai Publishers, 2012.

References:

1. Serway R A, Jewett J W, "Physics for Scientists and Engineers", Cengage Learning, 2010.
2. Halliday D, Resnick R, Walker J, "Principles of Physics", Wiley, 2015.
3. K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4. S.O. Kasap, Principles of Electronic Materials and Devices, Mc-Graw Hill, 2018.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	-	-	-	-	-	-	-	1	-	-	-
CO2	2	1	1	1	-	-	-	-	-	-	-	1	-	-	-
CO3	2	1	1	1	-	-	-	-	-	-	-	1	-	-	-
CO4	2	1	1	1	-	-	-	-	-	-	-	1	-	-	-
CO5	2	1	1	1	-	-	-	-	-	-	-	1	-	-	-
CO6	2	1	1	1	-	-	-	-	-	-	-	1	-	-	-
Avg.	**2**	**1**	**1**	**1**	-	-	-	-	-	-	-	**1**	-	-	-

GE24201	TAMILS AND TECHNOLOGY	HSMC	L	T	P	C
			1	0	0	1

Course Objectives:

This course enables the students to

- Understand the art of making things and developments in the lifestyle of people
- Understand the various methods of constructing buildings
- Understand the techniques being used in Architecture by Tamils
- Understand and apply the concepts of Tamils with modern technology

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold-Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Total Periods:15

Course Outcomes:
On completion of the course, the students will be able to:
CO1: Know the gradual improvement in the life history of Tamils
CO2: Construct buildings with the impact of the past with the present
CO3: Learn to manufacture remarkable things with the help of technology
CO4: Apply new Concepts in agriculture to the upliftment of the future society
CO5: Apply the ancient skills to find out the measurements of oceans
CO6: Apply the concepts of Tamil with modern technology

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

GE24201	தமிழரும் தொழில்நுட்பமும்	HSMC	L	T	P	C
			1	0	0	1

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம் 3

சங்க காலத்தில் நெசவு தொழில் – பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் –நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தொ-சாரோசெனிக் கட்டிடக் கலை.

அலகு III உற்பத்தித் தொழில் நுட்பம் 3

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம் 3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமக்கப்பட்ட கிணறுகள் –

வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி –கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

Total Periods:15

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

GE24111	**Engineering Graphics**	**ESC**	**L**	**T**	**P**	**C**
			2	**0**	**4**	**4**

Course Objectives:

- To draw engineering curves and freehand sketch of simple objects.
- To draw orthographic projection of solids and sections of solids.
- To draw development of solids
- To draw isometric and perspective projections of simple solids.

CONVENTIONS AND GEOMETRIC CONSTRUCTION (Not for examinations) 1

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 6+11

Basic curves used in engineering practices: Construction of conic sections by eccentricity method - Construction of cycloidal curves - Construction of involutes of square and circle - Drawing of tangents and normal to the above curves.
Visualization concepts and Free Hand sketching: Visualization principles - Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+11

Projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 6+11

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV SECTION AND DEVELOPMENT OF SOLIDS 6+12

Sectioning of simple solids like prisms, pyramids, cylinders, and cone in a simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

Principles of isometric projection - isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones - Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method.

COMPUTER AIDED DRAFTING (Demonstration Only, Not for Exam) 3

The Concepts of Computer Aided Drafting for Engineering drawing, Computer graphics & Geometrical modelling (2D Orthographic Views) and 3D drafting (Isometric Views) using design software.

Total Periods: 90

Course Outcomes:
On completion of the course, the students will be able to
CO1: Construct the conic curves, involutes and cycloids.
CO2: Visualize and construct multiple views of solid.
CO3: Solve practical problems involving projection of lines and planes.
CO4: Draw the projection of simple solids.
CO5: Draw the sectional views of simple solids, obtain true shape and develop sectioned solids.
CO6: Draw the isometric and perspective projections of simple solids.

Text Books:

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019.
2. Jayapoovan T, “Engineering Graphics using AUTOCAD”, Vikas Publishing ,7 th Edition.
3. Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.

References:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3. Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS10711 — 2001: Technical products Documentation — Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation —Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
4. 5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

Special points applicable to Semester End Examinations on Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	2	-	-	-	-	2	-	2	-	-	-
CO2	3	1	2	-	2	-	-	-	-	2	-	2	-	-	-
CO3	3	1	2	-	2	-	-	-	-	2	-	2	-	-	-
CO4	3	1	2	-	2	-	-	-	-	2	-	2	-	-	-
CO5	3	1	2	-	2	-	-	-	-	2	-	2	-	-	-
CO6	3	1	2	-	2	-	-	-	-	2	-	2	-	-	-
Avg.	3	1	2	-	2	-	-	-	-	2	-	2	-	-	-

AD24221	C and Elementary Data Structures Laboratory	PCC	L	T	P	C
			0	0	4	2

Course Objectives:

- To familiarize with C programming constructs.
- To develop applications in C using Structures and Pointers.
- To implement Abstract Data Types.
- To implement linear data structures – lists, stacks and queues.
- To implement Searching, Sorting, and Hashing Techniques.

LIST OF EXPERIMENTS:

1. Implementing basic C programs and control structures
2. Arrays: single and multi-dimensional arrays
3. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
4. String handling functions and operations

5. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
6. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
7. Implementation of Linked List.
8. Implementation of Stack using Arrays and Linked List.
9. Implementation of Queue using Arrays and Linked List.
10. Implementation of Stack and Queue applications.
11. Implementation of Insertion Sort, Heap Sort.
12. Implementation of Quick Sort, Merge Sort.
13. Implement any application using Linear Search.
14. Implementation any application using Binary Search

Total Periods:60

Course Outcomes:

On completion of the course, the students will be able to

CO1: Students will demonstrate the ability to effectively use control structures, functions, and recursion to create modular and maintainable code.

CO2: Design and develop applications in C using structures, union, and pointers.

CO3: Design and implement ADTs.

CO4: Design, implement, and analyse list, queues, and stacks according to the needs of various applications.

CO5: Appropriately use sort, search, and hashing techniques for a given application.

Laboratory Requirements:

S. No.	Description of Equipment	Required numbers (for batch of 30 students)
1	Stand alone desktops (Windows/Linux) with C Compiler	30

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	2	-	-	-	3	-	1	2	-	-	3
CO2	2	2	2	1	2	-	-	-	3	-	1	2	-	-	3
CO3	2	3	2	1	2	-	-	-	3	-	1	2	1	-	3
CO4	2	3	2	2	2	-	-	-	3	-	1	2	1	-	3
CO5	2	3	2	2	2	-	-	-	3	-	1	2	1	-	3
Avg.	**2**	**2.8**	**2**	**1.5**	**2**	**-**	**-**	**-**	**3**	**-**	**1**	**2**	**1**	**-**	**3**

GE24122	Engineering Practices Laboratory – Electrical and Electronics	ESC	L	T	P	C
			0	0	2	1

Course Objectives:

- To learn the basics of electronic components.
- To understand the internal structure and working of the measuring instruments.
- To construct a prototype circuit on a breadboard and verify.
- To understand the process behind the PCB fabrication.
- To introduce the functionality of various electrical components namely switches, fuse, and meters to perform wiring various electrical joints in common household electrical wire work.
- To introduce the methods for measuring electrical quantities

LIST OF EXPERIMENTS:

Electrical

1. Introduction to Electrical Components switches, fuses, indicators, and lamps
2. Basic switchboard wiring with lamp, fan, three-pin socket, and energy meter
3. Staircase wiring
4. Fluorescent Lamp wiring with introduction to CFL and LED types
5. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit

Electronics

1. Study of electronic components resistor, capacitor, inductor, transistor and diode.
2. Introduction to CRO, DSO, MSO, FG and their working principles.
3. Circuit prototyping and verification.
4. Build a printed circuit board and verify the desired output.

Total Periods: 30

Course Outcomes:

On completion of the course, the students will be able to

CO1: Identify and describe the function of various electronic components, leading to successful application in circuit design.
CO2: Accurately interpret and apply measurement data in practical scenarios.
CO3: Build a prototype of a circuit and validate its output.
CO4: Gain knowledge of PCB fabrication processes, including design, etching, and assembly.
CO5: Understand the working of electrical switches, measuring instruments, and wiring layouts used in domestic applications and carry out basic electrical wiring work.
CO6: Comprehend the concepts of current, voltage, power, and power factor using various measuring instruments

Laboratory Requirements:

S. No.	Description of equipment	Required numbers (for a batch of 30 students)
1.	Resistors, Capacitors, Inductors – sufficient quantities. Bread Boards	15 nos.
2.	CRO, MSO, DSO, FG, Power Supply	5 Nos.
3.	PCB etching kit (Ferric Chloride, Drilling machine, Layout design)	15 kits
4.	Soldering iron, paste, lead, desoldering pump	15 nos. each
5.	Single way switch, Two way switch, fuses, indicators, 230 V - 60W incandescent lamp	5 nos. each
6.	Basic switchboard wiring kit and Energy meter	5 nos. each
7.	Staircase wiring kit	5 nos. each
8.	Fluorescent Lamp wiring kit, CFL and LED lamps	5 nos. each

9	1φ Auto Transformer, Voltmeter, Ammeter, Rheostat, Capacitor, Choke	5 nos. each
10.	Multimeters	6 nos.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	2	-	1	2	1	-	-	-	-	-
CO2	2	1	1	2	1	-	-	-	2	1	-	-	-	-	-
CO3	2	1	1	1	1	-	-	-	2	1	-	-	-	-	-
CO4	2	1	1	1	1	-	-	-	2	1	-	-	-	-	-
CO5	2	1	1	1	1	-	-	1	2	1	-	-	-	-	-
Avg.	**2**	**1**	**1**	**2**	**1**	**2**	**-**	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**

PH24121 Physics Laboratory BSC L T P C

0 0 2 1

Course Objectives:

- To learn the measurements of various elastic moduli of materials
- To learn determination of thermal properties of materials.
- To study different optical phenomena involving ordinary light.
- To measure the characteristic properties of lasers.
- To understand the characteristics of oscillatory motion.
- To learn measurement of rigid body moment of inertia.

LIST OF EXPERIMENTS (any six experiments):

1. Non-uniform bending - Determination of Young's modulus
2. Uniform bending – Determination of Young's modulus
3. Lee's Disc Experiment - Determination of thermal conductivity of bad conductors.
4. Torsional pendulum - Determination moment of inertia of regular and irregular objects.
5. Simple harmonic oscillations of cantilever
6. Ultrasonic interferometer – determination of sound velocity and liquids compressibility
7. Viscosity of Liquids
8. Air wedge - Determination of thickness of a thin sheet/wire
9. Optical fibre -Determination of Numerical Aperture and acceptance angle
10. Spectrometer-Determination of the wavelength of light using grating
11. (a) Laser- Determination of the wavelength of the laser using grating
    (b) Compact disc- Determination of width of the groove using laser.

Total Periods: 30

Course Outcomes:
On completion of the course, the students will be able to
CO1: Determine various moduli of elasticity of materials
CO2: Determine thermal properties of solids
CO3: Analyze various optical phenomena involving ordinary light.
CO4: Determine the characteristic properties of lasers.

CO5: Measure characteristic properties of systems executing oscillatory motion.
CO6: Determine the moment of inertia of rigid bodies

Text Books:

1. Engineering Physics Practicals by Dr. P. Mani, Dhanam Publications, 2023
2. Practical Physics by Gordon L Squires, Cambridge University Press; 4th Edition, 2001

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	3	-	-	-	-	2	-	-	1	-	-	-
CO2	2	2	1	3	-	-	-	-	2	-	-	1	-	-	-
CO3	2	2	1	3	-	-	-	-	2	-	-	1	-	-	-
CO4	2	2	1	3	-	-	-	-	2	-	-	1	-	-	-
CO5	2	2	1	3	-	-	-	-	2	-	-	1	-	-	-
Avg.	2	2	1	3	-	-	-	-	2	-	-	1	-	-	-

GE24123 Design Thinking HSMC L T P C

0 0 2 1

Course Objectives:

- Students will understand the different learning methodologies
- Students will learn the art of observation and visualization
- Students will understand the need for empathy in problem-solving
- Students will learn how to work in a team
- Students will learn to use different design thinking tools to solve problems

Module 1	An Insight to Learning: Understanding the Learning Process and Kolb's Learning Styles	2
Module 2	Journey of my life: Visualization and Wheel of Life. *Introduction to project*	4
Module 3	Observation: Listening vs hearing, Beyond observations and Mind maps	2
Module 4	Teamwork: Divergent thinking and Brainstorming	2
Module 5	Customer Journey: Journey mapping	2
Module 6	Conflict management: Balancing priorities, Reacting and Responding, Constraints to opportunities	2
Module 7	Empathy: Persona and Empathy map	2
Module 8	Design Thinking Model: 5-step process: Empathize, define, ideate, prototype, and scale	2
Module 9	Appreciation: The wonder of recognition, Articulation and Influence	2
Module 10	Project presentation	10

Total Periods:30

Course Outcomes:
On completion of the course, the students will be able to
CO1: To understand various learning processes and stages
CO2: To observe and visualize different scenarios
CO3: To empathize with a customer

CO4: To develop a journey map based on experiences
CO5: To understand the art of conflict management
CO6: To use design thinking as a tool to solve problems

Suggested Activities:

- Solve real-life problems using Design Thinking

Text Books:

1. Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem-solving, Pavan Soni, Penguin Random House India, Pvt. Ltd. 2020
2. Developing Thinking Skills (The Way to Success), E. Balagurusamy, 2024, Khanna Publishing House
3. The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods, Michael Lewrick, Patrick Link, Larry Leifer, Wiley, March 2020

References:

1. Internet Reference: https://www.interaction-design.org/
2. Internet Reference: https://online.hbs.edu/
3. Internet Reference: https://dschool.stanford.edu/

MAPPING OF COs WITH POs AND PSOs

COs	Pos												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	1	1	-	-	3	-	-	-
CO2	-	-	-	-	-	2	-	-	-	-	-	3	2	-	-
CO3	-	-	-	-	-	2	-	2	2	2	-	3	2	-	-
CO4	-	-	-	-	-	2	-	-	-	-	-	3	2	-	-
CO5	-	-	-	-	-	2	-	2	2	2	-	3	-	-	-
CO6	-	-	-	-	-	3	-	2	3	2	2	3	2	-	-
Avg.	-	-	-	-	-	**2.1**	-	**1.7**	**2**	**2**	**2**	**3**	**2**	**-**	**-**

FC24102	Cultural Identities and Globalisation	HSMC	L	T	P	C
			2	0	0	0

Course Objectives:

- To enable students to reflect on their own cultural identity in relation to their socialisation.
- To encourage cultural diversity that underpins the formation of identity and social behaviours.
- To give exposure to the varied cultural influences on the parent culture.
- To prepare to address the challenges and tensions in the globalised society.

UNIT I Exploring Social and Cultural Identity 5

Identity formation & environmental interaction

- Race/ethnicity
- Gender
- Language
- Religion
- Socialisation (contact with different cultures)

UNIT II Regional and Cultural Influence on Social Behaviour and Identity 6

- Assimilation, Amalgamation and Hybridisation
- Cultural Behaviour - dialect, traditions, social behaviour (customs), etiquette (work culture), habits, cuisine and regional variation

UNIT III Dissemination of Mass Culture Practices 6

- Cultural Imperialism
- Colonisation and Globalization - Cultural turn
- Manufacturing pop culture - Language, food, movies, music, fashion, cosmetics.

UNIT IV Socio-Cultural Changes via Globalisation 6

- Indian globalisation through trade liberalisation
- Increased migration flow with economic opportunities
- Cultural exchange, global networks
- Urbanisation - impact on family ideology and social structure

UNIT V Embracing Global Identities 7

- Challenges and tension
- Adaptable to changing society - etiquettes (in cross-cultural workspace) and social behaviours
- Building understanding and tolerance

Total Periods: 30

Course Outcomes:
On completion of the course, the students will be able to
CO1: Engage in conversations with themselves in relation to their local culture and society.
CO2: Realise the nuances of identity formation through various means of socialisation.
CO3: Critically assess the countless social and cultural behaviours that influence their identity and behaviour.
CO4: Examine the role of globalisation and liberalisation in urbanisation and cultural imperialism.
CO5: Adapt to the cross-cultural changes and engage in global networking.
CO6: Respond appropriately in a multicultural space by building tolerance and understanding.

Suggested Activities
- Exercise on identity formation - creation of mind maps / storyboards
- A mini presentation on “Identifying one's own culture amidst the influence of the diverse cultural environment” - expressing only one cultural aspect (language, attire, habits, food, …)
- Opinion piece speech - Deliver a short speech expressing personal opinions
- Survey report - Comparison chart (5 exchanges) by engaging conversations with a elderly stranger or grandparents
- Produce a 30-second reel showcasing their understanding of the social etiquette of a specific country.

References:

1. Brooks, Ann. Popular Culture: Global Intercultural Perspectives. United Kingdom, Bloomsbury Publishing, 2014.
2. Verkuyten, Maykel. Identity and Cultural Diversity: What Social Psychology Can Teach Us. United Kingdom, Taylor & Francis, 2013, pp. 1-27.
3. Savage, Michael, et al. Globalization and Belonging. United Kingdom, SAGE Publications, 2004, pp. 29-77.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	2	1	-	2	-	-	-
CO2	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	1	-	2	-	-	-
CO4	-	-	-	-	-	2	1	-	2	1	-	2	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CO6	-	-	-	-	-	2	-	-	2	1	-	2	-	-	-
Avg.	-	-	-	-	-	**2**	**1**	-	**2**	**1**	-	**2**	-	-	-

Course Code	Course Name	Category	L	T	P	C
MA24301	**Discrete Mathematics**	**BSC**	**3**	**1**	**0**	**4**

Course Objectives:

- To develop logical skills for reasoning and constructing mathematical arguments using propositional and predicate calculus
- To equip students with the foundational techniques in combinatorics
- To familiarise with the basic concepts of graph theory
- To provide an understanding of algebraic structures and related applications in computer science
- To understand the concepts and significance of Lattices and Boolean algebra which are widely used in computer science and engineering

UNIT I LOGIC AND PROOFS 12

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference

UNIT II COMBINATORICS 12

Mathematical induction – Pigeonhole principle – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle

UNIT III GRAPHS 12

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connected Graphs – Eulerian and Hamiltonian Graphs

UNIT IV ALGEBRAIC STRUCTURES 12

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphisms (Applications only) – Isomorphisms (Applications only) - Ring (Definition only)- Field (Definition only)

UNIT V LATTICES AND BOOLEAN ALGEBRA 12

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Boolean Algebra and properties

Total Periods: 60

Course Outcomes:
On completion of the course, the students will be able to
CO1: Apply propositional and predicate calculus equivalences, and inference rules for valid mathematical arguments
CO2: Apply combinatorial techniques to solve problems
CO3: Identify and analyse properties of graph models inclusive of Eulerian and Hamiltonian graphs
CO4: Understand concepts of semi-groups, monoids, and groups in algebraic systems.

CO5: Understand the structure of lattices
CO6: Understand the concept of Boolean algebra

Suggested Activities:

- Create logic puzzle incorporating quantifiers (∀, ∃).
- Solve the Tower of Hanoi puzzle with different disk counts.
- Model a city's tourist spots and paths using a graph.
- Create a network diagram (e.g., of websites or devices) and analyze connectivity using graph theory concepts.

Text Books:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

References:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
4. Veerarajan, T., "Discrete Mathematics with Graph Theory and Combinatorics", Mc Graw Hill Publishers, India, 2017.
5. J.A. Bondy , U.S.R. Murty, "Graph Theory With Applications" , North Holland, New York, 1976
6. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Dover Publication, 2016.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	-	-	-	-	-	-	-	-	1	-	2
CO2	3	2	1	1	-	-	-	-	-	-	-	-	1	-	2
CO3	3	2	1	1	-	-	-	-	-	-	-	-	1	-	2
CO4	3	2	1	2	-	-	-	-	-	-	-	-	1	-	2
CO5	3	2	1	1	-	-	-	-	-	-	-	-	1	-	2
CO6	3	2	1	2	-	-	-	-	-	-	-	-	1	-	2
Avg.	3	2	1	2	-	-	-	-	-	-	-	-	1	-	2

Course Code	Course Name	Category	L	T	P	C
AD24301	Artificial Intelligence	PCC	3	0	0	3

Course Objectives:

- Study about uninformed and Heuristic search techniques
- To model and solve game-playing and constraint satisfaction problems
- Learn the different ways to represent knowledge in the knowledge base of an Intelligent Agent
- Perform logical and probabilistic reasoning
- To comprehend the use of software agents

UNIT I INTELLIGENT AGENTS AND PROBLEM SOLVING 10

Introduction to AI – Agents and Environments – Concept of rationality – Nature of environments – Structure of agents. Problem solving agents – Search algorithms – Uninformed search strategies - Informed search - Heuristic search strategies – Heuristic functions - Local search and optimization problems

UNIT II GAME PLAYING AND CSP 9

Game theory – Optimal Decisions in Games – Alpha-Beta Search – Monte-Carlo tree search – Stochastic games – Partially observable games. Constraint satisfaction problems – Constraint propagation – Backtracking search for CSP – Local Search for CSP.

UNIT III LOGICAL REASONING 9

Knowledge-based agents – Propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering. Inferences in first-order logic – forward chaining – backward chaining – resolution

UNIT IV PROBABILISTIC REASONING AND REINFORCEMENT LEARNING 9

Acting under uncertainty – Fuzzy Logic – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – Exact inference – Approximate inference – Reinforcement learning – Markov Decision Processes

UNIT V SOFTWARE AGENTS 8

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

Total Periods: 45

Course Outcomes:
On completion of the course, the students will be able to
CO1: Comprehend intelligent agent frameworks and apply various informed and uninformed strategies to problem solving.
CO2: Apply appropriate search algorithms to solve game playing and constraint satisfaction problems
CO3: To represent knowledge in prepositional and predicate logic and be able to apply inference mechanisms
CO4: Perform probabilistic reasoning under uncertainty
CO5: Analyze the architecture and interaction strategies of software agents in multi-agent systems
CO6: Design and implement an intelligent agent-based system to solve real world or simulated problems.

Suggested Activities

- Implement and compare BFS, DFS, A* on a maze-solving or pathfinding problem (e.g., 8-puzzle).
- Flipped classroom–Comparing of Different Algorithms
- Modelling real world problems such as sudoku as a CSP and solve it using backtracking + constraint propagation
- Ethical Agent Debate - Discuss how agents should make ethical decisions.

Text Books:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson Education, 2021.

References:

1. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education,2007
2. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
4. Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	-	-	-	-	-	-	-	-	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	-	-	3	2
CO3	3	3	2	2	2	-	-	-	-	-	-	-	-	3	2
CO4	3	3	2	2	2	-	-	-	-	-	-	-	-	3	2
CO5	3	3	2	2	2	-	-	-	-	-	-	-	-	3	2
CO6	2	3	3	2	2	-	-	-	-	-	-	-	-	3	2
Avg.	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

Course Code	Course Name	Category	L	T	P	C
AD24302	Non-Linear Data Structures and Algorithms	PCC	3	0	0	3

Course Objectives:

- To understand non-linear data structures – trees and graphs.
- To understand different algorithm design techniques
- To explain dynamic programming and greedy techniques for solving various problems.
- To examine the limitations of algorithmic power and handling it in different problems.

UNIT I TREES 9

Overview of Non-Linear data structures – Tree ADT – Tree Traversals - Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees: Balancing – Heaps - Binary Heap

UNIT II GRAPHS 9

Graph Definition – Representation of Graphs – Types of Graphs – Breadth first traversal – Depth first traversal — Bi-connectivity – Euler circuits – Finding shortest path: Dijkstra's algorithm –Minimum Spanning Tree: Prim's algorithm, Kruskal's algorithm

UNIT III ALGORITHM ANALYSIS 8

Algorithm analysis: Time and space complexity - Asymptotic Notations and its properties best case, Worst case and average case analysis – Recurrence relation: substitution method - Lower bounds – searching: linear search, binary search and Interpolation Search

UNIT IV DESIGN PARADIGMS 12

Divide and Conquer methodology: Finding maximum and minimum – Quick Sort – Merge Sort - Dynamic programming: Elements of dynamic programming – Matrix chain multiplication - Optimal Binary Search Trees - Floyd-Warshall Algorithm. Greedy Technique: Elements of the greedy strategy - Activity-selection problem — Huffman Trees - Backtracking: n-Queens problem - Subset Sum Problem – Branch and Bound: Knapsack problem - Travelling Salesman Problem

UNIT V NP COMPLETE AND NP HARD 7

Tractable and intractable problems: Polynomial time algorithms – Venn diagram representation - NP-algorithms - NP-hardness and NP-completeness – Bin Packing problem - Problem reduction: TSP – 3-CNF problem

Total Periods: 45

Course Outcomes:

On completion of the course, the students will be able to
CO1: Implement tree ADTs for efficient data organization
CO2: Solve graph algorithms using graph traversal algorithms
CO3: Evaluate algorithmic complexity using asymptotic notation
CO4: Apply algorithm design techniques such as divide and conquer, dynamic programming and greedy techniques to solve problems
CO5: Compare algorithm analysis for real-world problem optimization
CO6: To identify NP-complete problems and prove intractability

Suggested Activities
- Activities for Preorder, Inorder, and Postorder traversals through activity sheets
- Assign roles and simulate algorithms as a classroom roleplay.
- Solving Knapsack problems using dynamic programming, branch and bound and backtracking and greedy techniques.
- Group debate/discussion about tractable vs intractable problems with real-world examples.
- Analysis of algorithms - Code linear search, binary search, and interpolation search; analyze which works best under various data distributions.

Text Books:

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures and Algorithms in Python" (An Indian Adaptation), Wiley, 2021.
2. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.

References:

1. Narasimha Karumanchi, "Data Structures and Algorithmic Thinking with Python" Careermonk, 2015.
2. Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015.
3. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.
4. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.
5. S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.
6. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	-	-	-	-	-	3
CO2	3	3	2	2	2	-	-	-	-	-	-	-	-	-	3
CO3	3	3	2	3	2	-	-	-	-	-	-	-	-	-	3
CO4	3	3	2	3	2	-	-	-	-	-	-	-	-	-	3
CO5	2	3	2	3	2	-	-	-	-	-	-	-	-	-	3
CO6	3	3	2	3	2	-	-	-	-	-	-	-	-	-	3
Avg.	3	3	2	3	2	-	-	-	-	-	-	-	-	-	3

Course Code	Course Name	Category	L	T	P	C
BS24301	Environmental Science and Sustainability	BSC	3	0	0	3

Course Objectives:

- To introduce the basic concepts of environment, ecosystems.
- To emphasize on the biodiversity of India and its conservation.
- To familiarise with the causes and effects of different types of pollution in the environment.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability**.**
- To impart knowledge about waste management and their recovery methods.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles.

UNIT I ENVIRONMENT AND BIODIVERSITY 9

Definition, scope and importance of environment – need for public awareness. Ecosystem and Energy flow – food chain, food web, ecological pyramids-ecological succession. Types of biodiversity: genetic, species and ecosystem diversity – values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – endangered and endemic species of India, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, conservation of biodiversity: In-situ and ex-situ.

UNIT II ENVIRONMENTAL POLLUTION 9

Causes, Effects and Preventive measures of Air, Water, Soil, Thermal and Noise Pollutions. Nuclear hazards and human health risks-case study. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection-Air act, Water act, Environmental protection act. Role of an individual in prevention of pollution.

UNIT III SUSTAINABILITY AND MANAGEMENT 9

Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals - intervention areas- Climate change-global warming, acid rain, Ozone layer depletion- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT IV WASTE MANAGEMENT AND RESOURCE RECOVERY 9

Biodegradable, non-biodegradable wastes, Solid, Hazardous and E-Waste management.
Bio-medical waste management, Concept of waste to energy processes (WTE) - Combustion, Pyrolysis, Landfill gas (LFG) recovery. Recycling of spent batteries, end-of- life vehicle (ELV) recycling-Waste engine oil recycling-Solvent recovery, Barriers for material recycling-social, legal and economic factors-Environment impact of waste recycling.

UNIT V SUSTAINABILITY PRACTICES 9

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources-Ocean energy sources, Geothermal energy, Energy Cycles- carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio economical and technological change.

Total Periods: 45

Course Outcomes:

On completion of the course, the students will be able to

CO1: To understand the functions of the environment, ecosystems.
CO2: To analyse the threats of biodiversity and their conservation.
CO3: To explain the types of environmental pollution and environment protection acts.
CO4: To recognize the different goals of sustainable development and environmental standards.
CO5: To correlate the different types of waste management and possible resource recovery methods.
CO6: To explain the sustainability practices pertaining to sustainable energy, sustainable habitat and sustainable urbanization.

Suggested Activities

- Quiz
- Mind Mapping
- Group discussion
- Seminar
- Animated videos

Text Books:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998

References:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice Hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. Erach Bharucha "Text book of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	2	3	-	-	-	-	2	-	-	-
CO2	2	1	-	-	-	2	3	-	-	-	-	2	-	-	-
CO3	3	2	-	-	-	3	3	-	1	-	-	2	-	-	-
CO4	3	2	1	-	-	2	2	-	1	-	-	2	-	-	-
CO5	3	2	1	-	-	2	2	-	-	-	-	2	-	-	-
CO6	3	2	1	-	-	2	2	-	1	-	-	2	-	-	-
Avg.	2.7	1.6	1	-	-	2.2	2.5	-	1	-	-	2	-	-	-

Course Code	Course Name	Category	L	T	P	C
AD24311	Database Design and Management	PCC	2	0	4	4

Course Objectives:

- To introduce database development life cycle and conceptual modeling
- To learn SQL for data definition, manipulation and querying a database
- To learn relational database design using conceptual mapping and normalization
- To learn transaction concepts and serializability of schedules
- To learn data model and querying in object-relational and No-SQL databases

UNIT I CONCEPTUAL DATA MODELING 6

Database environment – Database system development lifecycle – Requirements collection – Database design -- Entity-Relationship model – Enhanced-ER model – UML class diagrams.

UNIT II RELATIONAL MODEL AND SQL 6

Relational model concepts – Integrity constraints – SQL Data manipulation – SQL Data definition – Views – SQL programming.

UNIT III RELATIONAL DATABASE DESIGN AND NORMALIZATION 6

ER and EER-to-Relational mapping – Update anomalies – Functional dependencies – Inference rules – Minimal cover – Properties of relational decomposition – Normalization (upto BCNF).

UNIT IV TRANSACTION MANAGEMENT 6

Transaction concepts – properties – Schedules – Serializability – Concurrency Control – Two-phase locking techniques.

UNIT V OBJECT RELATIONAL AND NO-SQL DATABASES 6

Mapping EER to ODB schema – Object identifier – reference types – rowtypes – UDTs – Subtypes and supertypes – user-defined routines – Collection types – Object Query Language; No-SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: Hbase data model and CRUD operations.

Periods: 30

LIST OF EXPERIMENTS

1) Database design using Conceptual modelling (ER-EER) – top-down approach Mapping conceptual to relational database and validate using Normalization.
2) Create a database table, add constraints (Primary Key, Unique, Check, Not Null), insert rows, update and delete rows using SQL DDL and DML commands
3) Create a set of tables, add foreign key constraints and incorporate referential integrity.
4) Query the database tables using different ‘where’ clause conditions, implement aggregate functions and set operations.
5) Query the database tables to explore sub queries and join operations.
6) Write user defined functions and stored procedures in SQL.
7) Execute complex transactions and realize DCL and TCL commands.
8) Write SQL Triggers for insert, delete, and update operations in a database table.
9) Create PL/SQL code to demonstrate the purpose of implicit and explicit cursors.
10) Write PL/SQL code to trap a predefined and non-predefined Oracle Server error.
11) Create View and Index for database tables with a large number of records.

12) Database design using EER-to-ODB mapping
13) Object features of SQL-UDTs and sub-types, Tables using UDTs, Inheritance, Method definition
14) Create Document, column and graph-based data using NOSQL database tools.
15) Develop database applications using IDE.

Course Outcomes:

On completion of the course, the students will be able to

CO1: Design conceptual data models for real-world scenarios.
CO2: Implement relational databases using SQL
CO3: Normalize relational schemas up to BCNF by analyzing functional dependencies and minimizing anomalies.
CO4: Analyze transaction properties, schedules, and concurrency control mechanisms
CO5: Design object relational databases and query using object query language
CO6: Perform CRUD operations in NoSQL databases

Suggested Activities:

1. Case Study to ER Diagram Conversion (Team Activity)
2. Normalization of Real-World Data (Hands-On Exercise)
3. SQL Query Challenges & Competitive Quizzes
4. Comparative Analysis: Relational vs. NoSQL Databases
5. Oracle Academy SQL/PLSQL Certification (Industry-Aligned Learning)

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017.

References:

1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Feuerstein, Steven, and Bill Pribyl. "Oracle PL/SQL Programming", 6th ed., O'Reilly Media, 2014.
3. Sadalage, P. J., & Fowler, M., "NoSQL distilled: A brief guide to the emerging world of polyglot persistence", Addison-Wesley, 2013.

Periods: 60
Total Periods: 90

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	3	-	-	-	2	-	-	2	2	-	3
CO2	3	2	3	-	3	-	-	-	2	-	-	2	2	-	3
CO3	3	3	3	2	3	-	-	-	2	-	-	2	2	-	3
CO4	3	3	2	2	3	-	-	-	-	-	-	2	-	-	3
CO5	3	2	3	-	3	-	-	-	-	-	-	2	2	-	3
CO6	3	2	3	2	3	-	-	-	2	-	-	2	2	-	3
Avg.	3	2	2	2	2	2	-	-	2	-	-	2	2	-	3

Laboratory Requirements:

S.No	Name of the Equipment/Software	Required numbers (for batch of 30 students)
1	INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2	Windows 10 or higher operating system / Linux Ubuntu 20 or higher	30
3	Oracle Database 12 or higher, MySQL 5.7 or equivalent	30

Course Code	Course Name	Category	L	T	P	C
CS24312	Object Oriented Programming in Java	PCC	2	0	4	4

Course Objectives:

- To understand Object Oriented Programming concepts and basics of Java programming language
- To know the principles of classes and inheritance
- To define interfaces and handle strings
- To define exception handling mechanisms
- To develop a java application with I/O operations, threads and generics classes
- To modularize Java applications using packages and efficiently manage data using the Collection Framework.

UNIT I INTRODUCTION TO OOP AND JAVA 6

Object oriented programming paradigms – Features of Object-Oriented Programming – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java

UNIT II CLASSES AND INHERITANCE 6

Defining classes in Java – Access modifiers - Constructors-Methods: Objects as Parameters – Returning Objects –Static: block, class, methods, and variables. Inheritance: Types of Inheritance – Super and final keywords – Method overloading and overriding – Dynamic Method Dispatch – Abstract Classes.

UNIT III INTERFACE, EXCEPTION HANDLING AND STRINGS 6

Interfaces: Implementing and extending interfaces - Exceptions – exceptions hierarchy- throwing and catching exceptions - built-in Exceptions – User defined Exception. Strings: Basic String class, methods and String Buffer Class.

UNIT IV I/O, GENERICS, MULTITHREADING 6

I/O Basics – Reading and Writing Console I/O– Reading and Writing Files (csv and txt file). Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Differences between multithreading and multitasking, thread life cycle, creating threads, Inter-thread communication.

UNIT V PACKAGES AND COLLECTIONS 6

Packages – Packages and Member Access – Importing Packages – Lambda Expressions – Collection Interfaces and classes: ArrayList, LinkedList, HashSet, TreeSet, HashMap, EnumMap.

Periods: 30

LIST OF EXPERIMENTS:

1. Develop java programs to solve simple problems (factorial, Fibonacci, binary search, selection/insertion sort)
2. Develop java programs using OOP principles.
3. Develop a java program to develop payslips for the employees with their gross and net salary. Define subclasses for Programmer, Assistant Professor, Associate Professor, Professor extending Employee.
4. Develop a Java Program to create an abstract class named Shape that contains two integers, and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area() that prints the area of the given shape.
5. Develop a Java program for implementation of interface.
6. Develop a program that takes as input the size of the array and the elements in the array and asks the user to enter a particular index and prints the element at that index. This program should generate different exceptions. To handle these exceptions, use exception handling mechanisms.
7. Develop a Java program to implement string handling mechanisms.
8. Develop a Java program to perform file operations (Count the number of times a character appears in a file, Copy the content from one file to another).
9. Develop applications to demonstrate features of generic classes.
10. Develop a Java program to implement a multithreaded application.
11. Develop a java program to search for an element in an array using generic classes.
12. Develop a java program to find the average of an array of elements using generic classes.
13. Create a Java program to demonstrate Java built in packages.
14. Create a Java program to create and use a user defined package.
15. Develop a Java program that demonstrates different Collection Framework classes and interfaces.
16. Develop a real-time GUI based Java application.

Periods: **60**
Total Periods: 90

Course Outcomes:
On completion of the course, the students will be able to
CO1: Apply the concepts of object-oriented programming to solve simple problems
CO2: Develop programs using classes and inheritance
CO3: Develop programs using interfaces and string methods
CO4: Make use of exception handling mechanisms to solve real world problems
CO5: Build Java applications with packages and generics
CO6: Apply Java collections to solve real-world problems

Suggested Activities
- Mini Project

Text Books:

1. Herbert Schildt, ―Java The complete reference, 11th Edition, McGraw Hill Education, 2019
2. Cay S. Horstmann, “Core Java Fundamentals”, Volume 1, 11 th Edition, Prentice Hall, 2018.

References:

1. Paul Deitel, Harvey Deitel, “JAVA SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2. Oracle Academy Resources.

Laboratory Requirements:

1. INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse.
2. Windows 10 or higher operating system / Linux Ubuntu 20 or higher.
3. JDK 17 or above (Oracle or OpenJDK)/ Eclipse IDE for Java Developers / IntelliJ IDEA Community Edition / NetBeans / VS Code with Java Extension Pack.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	2	3	2	-
CO2	3	2	3	-	3	-	-	-	-	-	-	2	3	2	-
CO3	3	2	3	-	3	-	-	-	-	-	-	2	3	2	-
CO4	3	2	3	-	3	-	-	-	-	-	-	2	3	2	-
CO5	3	2	3	-	3	-	-	-	-	-	-	2	3	2	-
CO6	3	2	3	-	3	-	-	-	-	-	-	2	3	2	-
Avg.	**3**	**2**	**2.8**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**	**-**

Course Code	Course Name	Category	L	T	P	C
AD24321	Artificial Intelligence Laboratory		0	0	3	1.5

Course Objectives:

- To design and implement search strategies
- To implement game playing techniques
- To implement CSP techniques
- To develop systems with logical reasoning
- To develop systems with probabilistic reasoning

LIST OF EXPERIMENTS

1. Implement uninformed search strategies – BFS and DFS algorithm
2. Implement basic search strategies – 8-Puzzle, 8 - Queens problem, Cryptarithmetic.
3. Implement A* and memory bounded A* algorithms
4. Implement Minimax algorithm for game playing (Alpha-Beta pruning)
5. Solve constraint satisfaction problems (Sudoko Solver)
6. Implement local search algorithms (hill climbing and simulated annealing)
7. Representation of knowledge base
8. Implement forward chaining algorithm
9. Implement backward chaining
10. Implement resolution strategies
11. Build naïve Bayes models (Spam detection)
12. Implement Bayesian networks and perform inferences
13. Implement Reinforcement learning in a Grid-Based MDP Environment
14. Design an Agentic AI system
15. Mini-Project

Total Periods: 45

Course Outcomes:

On completion of the course, the students will be able to
CO1: Design and implement search strategies

CO2: Implement game playing and CSP techniques
CO3: Develop logical reasoning systems using propositional and first-order logic.
CO4: Develop probabilistic reasoning systems
CO5: Develop reinforcement learning agents for MDP environments.
CO6: Integrate AI techniques to design an autonomous agent

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	-	-	-	-	-	-	-	-	3	2
CO2	3	2	3	2	3	-	-	-	-	-	-	-	-	3	2
CO3	3	2	3	2	3	-	-	-	-	-	-	-	-	3	2
CO4	3	2	3	2	3	-	-	-	-	-	-	-	-	3	2
CO5	3	2	3	2	3	-	-	-	-	-	-	-	-	3	2
CO6	3	2	3	2	3	-	-	-	-	-	-	-	-	3	2
Avg.	**3**	**2**	**3**	**2**	**3**	-	-	-	-	-	-	-	-	**3**	**2**

Laboratory Requirements:

S.No	Name of the Equipments/Software	Required Numbers
1	INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and Mouse	30
2	Windows 10 or higher operating system / Linux Ubuntu 20 or higher	30
3	Python, Numpy, Scipy, Matplotlib, Pandas, Seaborn	-
4	Python 3.9 and above	-

Course Code	Course Name	Category	L	T	P	C
AD24322	**Non-Linear Data Structures and Algorithms Laboratory**		**0**	**0**	**3**	**1.5**

Course Objectives:

- To be able to implement fundamental data structures (trees, graphs, heaps).
- To design efficient traversal and pathfinding algorithms.
- To be able to apply algorithmic design paradigms (divide-and-conquer, transform-and-conquer).
- To formulate dynamic programming and greedy solutions.
- To perform critical analysis of algorithmic complexity and trade-offs.

LIST OF EXPERIMENTS

1. Implementations of tree representation and traversal algorithms
2. Implementation of Binary Search Trees
3. Implementation of Heaps
4. Graph representation and Traversal algorithms
5. Implementation of single source shortest path algorithm
6. Implementation of minimum spanning tree algorithms
7. Implement recursive and non-recursive algorithms and study the order of growth from log2n to n!

8. Implement Divide and Conquer techniques - Strassen's Matrix Multiplication, Quick Sort, Merge Sort
9. Implement Decrease and Conquer - Topological Sorting
10. Implement Transform and Conquer - Heap Sort
11. Solve Knapsack Problem using Dynamic programming
12. Greedy Technique – Dijkstra's algorithm
13. Implement Backtracking algorithm
14. Implement Branch and Bound algorithm

Total Periods: 45

On completion of the course, the students will be able to
CO1: Implement tree/graph traversals and BST operations efficiently
CO2: Design shortest-path and MST algorithms for weighted graphs
CO3: Formulate solutions using divide-and-conquer algorithms
CO4: Implement dynamic programming and greedy algorithms
CO5: Develop backtracking and branch-and-bound solutions for NP-hard problems
CO6: Compare algorithmic growth rates

References:

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures and Algorithms in Python" (An Indian Adaptation), Wiley, 2021.
2. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012
3. Narasimha Karumanchi, "Data Structures and Algorithmic Thinking with Python" Careermonk, 2015.
4. Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	-	-	-	-	-	3
CO2	3	3	2	2	2	-	-	-	-	-	-	-	-	-	3
CO3	3	3	2	3	2	-	-	-	-	-	-	-	-	-	3
CO4	3	3	2	3	2	-	-	-	-	-	-	-	-	-	3
CO5	3	3	2	3	2	-	-	-	-	-	-	-	-	-	3
CO6	2	3	2	3	2	-	-	-	-	-	-	-	-	-	3
Avg.	**3**	**3**	**2**	**3**	**2**	**-**	**-**	**-**	-	-	-	-	-	-	**3**

Laboratory Requirements:

S.No	Name of the Equipments/Software
1	INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse
2	Windows 10 or higher operating system / Linux Ubuntu 20 or higher
3	Dev C++ / Eclipse CDT / Code Blocks / CodeLite / equivalent open source IDE

Course Code	Course Name	Category	L	T	P	C
BS24321	**System Discovery and Analysis**		**0**	**0**	**2**	**0**

Course Objectives:

- To identify key components of any hardware.
- To analyse individual components and its working.
- To understand how data and control flows within a system
- To identify the need, the user, and functional specifications of the system
- To understand the evolution of an electronic system through study and presentation

List of Components:
Any two components can be selected per semester

1) Installation of various Operating Systems.
2) CPU.
3) Wifi Access Point / Switch.
4) Printer
5) Raspberry Pi/ Arduino Board

System Discovery (6 periods)
System Analysis (18 periods)
Presentation + Documentation (6 periods)

Total Periods: 30

Course Outcomes:

On completion of the course, the students will be able to

1. Identify and describe the essential components and architecture of commonly used hardware systems.
2. Evaluate and document system design requirements, including end-user needs, functional goals, constraints, and standards.
3. Use project management tools, bull and octopus diagrams to understand the existing system.
4. Disassemble and analyze systems to distinguish between hardware, software, and network components
5. Understand and articulate how information is processed, transmitted, and stored.
6. Propose an improvisation of any existing system by adopting a new design and technology.

Text Books:

- Laboratory Manual

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	1	-	-	-	-	3	1	-	1	-	-	-
CO2	2	2	-	1	-	-	-	-	3	1	1	1	-	-	-
CO3	2	2	-	1	-	-	-	-	3	1	1	1	-	-	-
CO4	2	2	-	2	-	-	-	-	3	1	-	1	-	-	-
CO5	2	2	-	2	-	-	-	-	3	1	-	1	-	-	-
CO6	2	2	-	1	-	-	-	-	3	1	-	1	-	-	-
Avg.	2	2	-	1	-	-	-	-	3	1	1	1	-	-	-

Course Code	Course Name	Category	L	T	P	C
MA24403	Transforms and Linear Algebra	BSC	3	1	0	4

Course Objectives:

- To acquaint the student with the concepts of Fourier transform techniques
- To introduce Z transform and difference equations and to equip with techniques for solving discrete time systems
- To provide a fundamental understanding of vector spaces, subspaces, and their properties
- To facilitate the understanding of the concepts of linear transformation and diagonalization
- To familiarise the concepts of inner product spaces and orthogonalisation

UNIT I FOURIER TRANSFORMS 12

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT II Z - TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms - Elementary properties(without proof) – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

UNIT III VECTOR SPACES 12

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.

UNIT IV LINEAR TRANSFORMATION AND DIAGONALIZATION 12

Linear transformation - Null spaces and ranges - Dimension theorem - Matrix representation of a linear transformations - Eigenvalues and eigenvectors – Test for Diagonalizability.

UNIT V INNER PRODUCT SPACES 12

Inner product, norms - Gram Schmidt orthogonalization process - Adjoint of linear operations - Least square approximation

Total Periods: 60

Course Outcomes:
On completion of the course, the students will be able to
CO1: Solve problems of engineering using Fourier transform
CO2: Apply Z-transforms to solve linear difference equations arising in discrete time systems
CO3: Apply the knowledge to solve problems involving linear combinations, independence, and dimension.
CO4: Understand the use of advanced algebraic techniques.
CO5: Understand the concepts of linear transformations and diagonalization
CO6: Effectively use the concepts of orthogonalisation and least square method to solve problems

Text Books:

1. Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

3. Friedberg, A.H., Insel, A.J. and Spence, L., ―Linear Algebra, Prentice Hall of India, New Delhi, 2004
4. Kwak, J.H, Hong, S., -Linear Algebra, Birkhauser Publishers, Second Edition, Springer International Edition, 1997.

References:

1. Kolman, B. Hill, D.R., ―Introductory Linear Algebra, Pearson Education, New Delhi, First Reprint, 2009.
2. Kumaresan, S., ―Linear Algebra – A Geometric Approach, Prentice – Hall of India, New Delhi, Reprint, 2010.
3. Lay, D.C., ―Linear Algebra and its Applications, 5th Edition, Pearson Education, 2015.
4. Strang, G., ―Linear Algebra and its applications, Thomson (Brooks/Cole), New Delhi, 2005.
5. Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
6. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
7. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
8. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
9. R. C. DiPrima and W. E. Boyce: Ordinary Differential Equations and Boundary Value Problems, Willey

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-	-	1	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
Avg.	3	2	1	1	-	-	-	-	-	-	-	-	-	1	-

Course Code	Course Name	Category	L	T	P	C
AD24401	Machine Learning	PCC	3	0	0	3

Course Objectives:

- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
- To evaluate the algorithms based on corresponding metrics identified

UNIT I INTRODUCTION TO MACHINE LEARNING 8

Introduction and motivation for machine learning; Types of Machine Learning, Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.

UNIT II LINEAR MODELS 9

Linear classification – univariate linear regression – bivariate regression–multivariate linear regression – regularized regression – Logistic regression. Naïve Baye's–Discriminant Functions -

Probabilistic Generative Models – Probabilistic Discriminative Models–Bayesian Logistic Regression.

UNIT III SUPERVISED LEARNING 11

Supervised Learning: Overview – Support vector machines: – soft margin SVM – going beyond linearity – generalization and overfitting – regularization – validation. Decision trees: Training and Visualizing a Decision Tree - Making Predictions - Estimating Class Probabilities - The CART Training Algorithm - Computational Complexity - Gini Impurity or Entropy - Ensemble methods: Bagging- Boosting- Boosting AdaBoost - Gradient Boosting – XG boost.

UNIT IV UNSUPERVISED LEARNING 9

Unsupervised learning: K-means, Hierarchical clustering - Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization. Dimensionality Reduction: Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis.

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 8

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, Measuring classifier performance – confusion matrix, F1 Score, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar's test, K-fold CV paired t test

Total Periods: 45

Course Outcomes:

On completion of the course, the students will be able to
CO1: Understand foundational concepts and theoretical frameworks of Machine Learning
CO2: Implement linear and probabilistic models for classification and prediction tasks
CO3: Apply supervised learning techniques to real-world problems
CO4: Design unsupervised learning solutions for clustering and dimensionality reduction
CO5: Evaluate ML models using rigorous experimental methodologies
CO6: Develop end-to-end ML solutions by integrating appropriate algorithms, validation techniques, and ethical considerations.

TEXT BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.
3. Aurélien Géron – Hands – On Machine Learning with Scikit Learn, Keras ,and Tensor Flow, 2nd Edition. September2019, Reilly Media, Inc.,

REFERENCES:

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2018.
4. Sebastain Raschka, Vahid Mirjalili , "Python Machine Learning", Packt publishing, 3rd Edition, 2019.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	2	2	2	-	-	-	-	-	-	-	-	3	-
CO3	3	3	2	2	2	-	-	-	-	-	-	-	-	3	-
CO4	3	3	2	2	2	-	-	-	-	-	-	-	-	3	-
CO5	2	3	2	2	2	-	-	-	-	-	-	-	-	3	-
CO6	3	3	3	2	3	-	-	-	-	-	-	-	-	3	-
Avg.	**3**	**3**	**2**	**3**	**2**	**-**	**-**	**-**	-	-	-	-	-	**3**	**-**

Course Code	Course Name	Category	L	T	P	C
CS24401	Operating Systems	PCC	3	0	0	3

Course Objectives:

- Understand core operating system concepts and their role in modern computing environments.
- Analyze the management of processes and multithreaded programs.
- Study CPU scheduling algorithms and mechanisms for process synchronization.
- Understand and address deadlock situations in concurrent systems.
- Examine memory management strategies and virtual memory implementations.
- Explore I/O systems and storage management techniques.

UNIT I Fundamentals of Operating Systems 7

Computer Systems Overview - Components, Architecture, and Functions - Evolution of Operating Systems - Historical milestones to modern trends - Operating System Structures - Monolithic, Layered, Microkernel, and Modular Approaches-System Calls and OS Services - User and Kernel Modes - System Programs and Utilities - Operating System Design and Implementation - Best Practices and Structuring Techniques.

UNIT II Process and Thread Management 8

Processes - Concepts, States, Process Control Block (PCB) - Operations on Processes - Creation and Termination - Threads - Models (1:1, N:1, M:N), Advantages, Threading Issues, Multithreading Models and Applications - Inter-Process Communication (IPC) - Shared Memory and Message Passing.

UNIT III CPU Scheduling and Synchronization 10

CPU Scheduling - Scheduling Criteria, Algorithms (FCFS, SJF, Round Robin, Priority, Multilevel Queue) - Process Synchronization - The Critical Section Problem - Synchronization Techniques – Semaphores, Mutexes, Monitors, Spinlocks and Livelocks - Classical Synchronization Problems - Producer-Consumer - Deadlocks - Conditions, Prevention, Avoidance, Detection, and Recovery.

UNIT IV Memory Management and Virtual Memory 10

Memory Management Overview - Contiguous and Non-contiguous Allocation – Paging - Page Tables, TLBs - Segmentation and Segmentation with Paging - Virtual Memory Concepts - Demand Paging, Copy-on-Write (CoW) - Page Replacement Algorithms - FIFO, LRU, Optimal - Thrashing and Working Set Model - Frame Allocation Strategies.

UNIT V Storage and File System Management 10

Storage Systems - Disk Structures, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN) - File Systems - Architecture, Implementation, Directory Structures - File Access Methods, File Sharing and Protection - Free Space Management – Bitmaps, Linked Lists - I/O Systems - Device Management, Kernel I/O Interface, Application I/O Interface - Introduction to RAID Levels and Storage Virtualization Concepts.

Total Periods: 45

Course Outcomes:

On completion of the course, the students will be able to

CO1: Explain the structure and functionalities of modern operating systems and system calls.
CO2: Analyze process management techniques, multithreading and inter-process communication.
CO3: Evaluate various CPU scheduling algorithms and implement synchronization.
CO4: Design solutions for deadlock handling in concurrent systems.
CO5: Analyze and apply memory management techniques.
CO6: Understand file system structures, disk scheduling and storage management methods.

Suggested Activities

- Research and present a timeline of the evolution of operating systems (from batch systems to cloud-native OS like AWS Nitro).
- Mini Project: Build a producer-consumer model using multithreading concepts.
- Create a CPU Scheduling simulator

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, 10th Edition, Wiley, 2018.
2. Andrew S. Tanenbaum, Modern Operating Systems, 5th Edition, Pearson, 2022.

References:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, Operating Systems – A Spiral Approach, McGraw Hill, 2010.
2. William Stallings, Operating Systems: Internals and Design Principles, 7th Edition, Prentice Hall, 2018.
3. Achyut S. Godbole, Atul Kahate, Operating Systems, McGraw Hill Education, 2016.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	2	3	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	2	3	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	2	3	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	2	3	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	2	3	-	-
Avg.	3	2.5	2	2	-	-	-	-	-	-	-	2	3	-	-

Course Code	Course Name	Category	L	T	P	C
AD24411	Data Engineering	PCC	3	0	2	4

Course Objectives:

- To understand the techniques and processes of data science
- To learn and use data models
- To understand the ETL pipeline
- To use data wrangling and feature engineering
- To understand the importance of Data Security

UNIT I INTRODUCTION TO DATA ENGINEERING 9

Data Engineering vs. Data Science - Role of a Data Engineer – DataOps - Data Formats: CSV, JSON, XML, Parquet, Avro - Defining Analytics - Types of data analytics - Descriptive Analytics - Stem and Leaf Plots - Frequency table - Time Series data - Central Tendency Measures of the location of data - Dispersion measures - Correlation analysis.

UNIT II DATA MODELS 10

Relational Databases: MySQL/PostgreSQL – NoSQL Databases: Document Based systems – Key value Stores – Column Based Systems – Graph Databases. Analytics Storage Solutions – Data Warehouses – Data Lake – Data Mart – Star/Snowflake schemas – Slowly Changing Dimensions - OLAP

UNIT III ETL AND DATA PIPELINES 9

ETL vs ELT - Introduction to Data Pipelines - Batch Processing and Stream Processing Data Pipeline Stages - Extraction (API, Web Scraping) - Ingestion (Batch Vs Stream) - Cleaning - Transformation - Feature management - Data Versioning – Dimension Modelling

UNIT IV DATA WRANGLING AND FEATURE ENGINEERING 10

Exploratory Data Analysis, Data Wrangling - Data cleaning - Data Aggregation, Sampling - Statistical descriptions of data - Measuring data similarity & dissimilarity - Handling Numeric Data - Discretization, Binarization - Normalization - Data Smoothening - Dealing with textual Data - Dealing with Images, audio and video data - Managing Categorical Attributes, Feature Engineering - Feature Subset Selection - Feature Reduction – Hypothesis testing – chi square test - t test – z test.

UNIT V ETHICS AND DATA SCIENCE 7

Data Science and Ethics – Bias and Fairness in data – Types of Bias – Testing for Bias – Fixing the Bias – Five C's in Data - Data Privacy and Security – Europe's GDPR - HIPAA - Indian Information Technology (IT) Act - Ethical Considerations in Data Usage - Auditing and Logging

Periods: 45

LIST OF EXPERIMENTS

1. Load, inspect, and convert between CSV, JSON, XML, Parquet, Avro using Pandas or PySpark.
2. Fetch data from an open API (e.g., weather, COVID) and save it locally in multiple formats.
3. Extract data from an API or CSV, transform and clean it (e.g., missing value handling, type casting), and load into PostgreSQL/MongoDB.

4. Given a dataset with missing values and multiple features, perform data normalization and data transformation.
5. Create tables, insert records, perform CRUD operations using SQL and Python
6. Use MongoDB (Document Store) to store and retrieve nested JSON documents.
7. Querying and aggregating with MongoDB queries.
8. Design a simple data warehouse schema for a sales domain using fact and dimension tables. Implement Slowly Changing Dimensions (SCD)
9. Using a dataset with continuous and categorical features, apply feature selection techniques to identify the most relevant features for predicting a continuous target variable
10. Implement batch and streaming ingestion using Pyspark to ingest data into PostgreSQL/MongoDB
11. Mini Project – Build a complete pipeline from ingestion to analytics

Suggested Activities:

- Sketch a data pipeline for a real-world scenario (e.g., Uber ride data)
- To analyze a dataset (e.g., COVID-19 time-series) for descriptive analytics
- Data Format conversions competitions
- Dataset investigation to find out the correlation and causation
- Group discussion for topics in unit 5 - Discuss ethical dilemmas

Course Outcomes:

On completion of the course, the students will be able to
CO1: Understand data engineering roles and pipeline stages
CO2: Design efficient relational and NoSQL data models
CO3: Construct ETL pipelines for batch/streaming workflows
CO4: Transform raw data into optimized analytical features
CO5: Understand and compliance to data security practices
CO6: Deploy scalable data solutions for real-world analytics

Text Books:

1. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.
2. Davy Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
3. Pang-Ning Tan, Anuj Karpatne, Michael Steinbach, Vipin Kumar “Introduction to Data Mining”, Global Edition 2019
4. Mike Loukides, Hilary Mason, and DJ Patil “Ethics and Data Science”, O’Reilly, 2018
5. Joe Reis & Matt Housley "Fundamentals of Data Engineering" O'Reilly Media, 2022

References:

1. "Data Engineering with Python" by Paul Crickard
2. Prabhu S and Venkatesan N, “Data Mining and Warehousing”, New Age International Pvt Ltd Publishers; First Edition, 2006
3. A Survey on Bias and Fairness in Machine Learning
4. Andreas Kretz, “The Data Engineering Cookbook”

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	-	-	-	3	-	-
CO2	3	2	2	-	2	-	-	-	-	-	-	-	3	-	-
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	-	-
CO4	3	2	2	2	2	-	-	-	-	-	-	-	3	3	-
CO5	2	2	-	-	2	2	-	2	-	-	-	-	3	-	-
CO6	2	2	3	2	2	-	-	-	-	-	-	-	3	3	-
Avg.	**3**	**2**	**2**	**2**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**-**

Laboratory Requirements:

S.No	Name of the Equipments/Software	Required
1	INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse	30
2	Windows 10 or higher operating system / Linux Ubuntu 20 or higher	30
3	Python 3.9 and above	30
4	Jupyter Notebook, Scipy, statmodels, seaborn, plotly, PySpark	30
5	MySQL, Mongo DB or equivalent	30

Course Code	Course Name	Category	L	T	P	C
CS24311	**Digital Principles and Computer Organization**	**ESC**	**3**	**0**	**2**	**4**

Course Objectives:

- Understand the fundamentals of number systems, codes, and combinational logic circuits.
- Analyze and design sequential logic circuits using flip-flops, counters, and state machines.
- Comprehend the basic structure, functional units, and operations of a digital computer.
- Develop knowledge on processor architecture including data path design, control units, and pipelining concepts.
- Explore memory organization, management techniques, and understand input/output interfacing mechanisms.

UNIT I COMBINATIONAL LOGIC 9

Number systems, Conversion of bases, Signed arithmetic, Complement, Parity bits, weighted and non-weighted codes, Logic gates, Combinational Circuits – Karnaugh Map - Design Procedures – Binary Adder – Subtractor – Decimal Adder - Decoder – Encoder – Multiplexers – Demultiplexers.

UNIT II SYNCHRONOUS SEQUENTIAL LOGIC 9

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation – Shift Registers – Counters.

UNIT III COMPUTER FUNDAMENTALS 9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA) of MIPS: Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of MIPS Instruction – Interaction between Assembly and High Level Language.

UNIT IV DATAPATH & CONTROL DESIGN 9

Instruction Execution – Building a Data Path – Single cycle and Multicycle Implementation - Designing a Control Unit – Pipelining - Pipelined data path – Structural Hazard - Data Hazard - Control Hazards

UNIT V MEMORY AND I/O 9

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.

Periods: 45 Hours

List of Experiments:

1. Design and implementation of combinational circuits using gates for arbitrary functions.
2. Implementation of 4-bit binary adder/subtractor circuits.
3. Implementation of code converters.
4. Implementation of BCD adder.
5. Implementation of encoder and decoder circuits.
6. Implementation of Multiplexers and Demultiplexers.
7. Implementation of functions using Multiplexers.
8. Implementation of the counters.
9. Implementation of Shift register.
10. Simulator based study of Computer Architecture.

Periods: 30
Total Periods: 75

Course Outcomes:

On completion of the course, the students will be able to

CO1: Perform conversions between number systems, and solve problems related to signed arithmetic and binary codes.

CO2: Design and simplify combinational logic circuits using logic gates and Karnaugh Maps.

CO3: Analyze and design synchronous sequential circuits using flip-flops, shift registers, and counters.

CO4: Explain the functional units of a digital computer and describe instruction execution, addressing modes, and instruction sequencing.

CO5: Develop data path and control unit designs (both hardwired and microprogrammed) and analyze the concept of pipelining with hazards.

CO6: Understand memory hierarchy, cache mapping techniques, virtual memory concepts, and various I/O interfacing standards like DMA, USB, and SATA.

Text Books:

1. M. Morris Mano, Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, Sixth Edition, Pearson Education, 2018.
2. David A. Patterson, John L. Hennessy, “Computer Organization and Design, The Hardware/Software Interface”, Sixth Edition, Morgan Kaufmann/Elsevier, 2020.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw-Hill, 2012.

References:

1. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Tenth Edition, Pearson Education, 2016.
2. M. Morris Mano, “Digital Logic and Computer Design”, Pearson Education, 2016.

Laboratory Requirements:

S. No.	Name of the Equipments / Software	Required
1	Digital Trainer Kit	15 Nos.
2	ICs - OR,AND, NOT, NAND, XOR, 4 bit Adder, FFs	As Required
3	Connecting Wires	As Required

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	3	2	-	1	-	-	-
CO2	3	3	2	-	-	-	-	-	3	2	-	1	-	-	-
CO3	3	3	2	-	-	-	-	-	3	2	-	1	-	-	-
CO4	3	1	1	-	-	-	-	-	0	0	-	1	-	-	-
CO5	3	1	1	-	-	-	-	-	0	0	-	1	-	-	-
CO6	3	0	1	-	-	-	-	-	0	0	-	1	-	-	-
Avg.	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**-**	**1**	**-**	**-**	**-**

Course Code	Course Name	Category	L	T	P	C
AD24421	Machine Learning Laboratory	PCC	0	0	3	1.5

Course Objectives:

- To understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis.
- To learn to implement supervised machine learning algorithms on standard datasets and evaluate the performance.
- To experiment the unsupervised machine learning algorithms on standard datasets and evaluate the performance.
- To compare the performance of different ML algorithms and select the suitable one based on the application.

LIST OF EXPERIMENTS

1. Introduction to Python and ML Libraries: Numpy, Pandas, Scikit-learn
2. Implementation of univariate, bivariate and multivariate regression
3. Implementation of Linear Regression and Evaluation Metrics (MSE, R^2)
4. Implementation of Logistic Regression with ROC Curve and AUC Analysis
5. Classification of text/spam dataset using Naïve Bayes
6. Train and evaluate a Support Vector Machine (SVM) with linear and non-linear kernel
7. Implement and visualize a Decision Tree Classifier
8. Implement Random Forest Classifier
9. Implement Ensemble Methods: Bagging and Boosting (AdaBoost, Gradient Boosting, XGBoost)
10. Implement Clustering Algorithm
11. Implement K-Nearest Neighbors (KNN) for classification
12. Apply Gaussian Mixture Model (GMM) and Expectation-Maximization (EM) algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms.
13. Principal Component Analysis (PCA) for Dimensionality Reduction
14. Design and Evaluation of a Machine Learning Pipeline with Cross-Validation, Performance Metrics, and Statistical comparison of Classifiers
15. Mini Project

Total Periods: 45

On completion of the course, the students will be able to

CO1: Implement and evaluate regression models

CO2: Implement supervised machine learning algorithms on standard datasets and evaluate the performance.

CO3: Construct neural networks for supervised learning tasks

CO4: Apply unsupervised machine learning algorithms on standard datasets and evaluate the performance.
CO5: Assess and compare the performance of different ML algorithms and select the suitable one based on the application.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	-	-	-	-	-	-	-	-	3	-
CO2	3	2	3	2	3	-	-	-	-	-	-	-	-	3	-
CO3	3	2	3	2	3	-	-	-	-	-	-	-	-	3	-
CO4	3	2	3	2	3	-	-	-	-	-	-	-	-	3	-
CO5	3	2	2	2	3	-	-	-	-	-	-	-	-	3	-
Avg.	**3**	**2**	**3**	**2**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**-**

Course Code	Course Name	Category	L	T	P	C
CS24421	Operating Systems Laboratory	PCC	0	0	3	1.5

Course Objectives:

- Provide hands-on experience in understanding operating system concepts.
- Familiarize students with system calls, process management, and scheduling techniques.
- Enable students to implement memory management and file system operations.
- Demonstrate synchronization techniques using semaphores and threads.
- Train students to simulate deadlock prevention, avoidance, and detection strategies.
- Explore disk scheduling and virtualization through real-world tools and C programming.

LIST OF EXPERIMENTS:

1. Execute basic UNIX/Linux shell commands.
2. Develop simple shell scripts for automation tasks.
3. Write C programs to demonstrate process creation and management using fork(), exit(), getpid(), wait(), and close() system calls.
4. Develop C programs to simulate various CPU scheduling algorithms:
    i. First-Come, First-Served (FCFS)
    ii. Shortest Job First (SJF)
    iii. Priority Scheduling
    iv. Round Robin (RR)
5. Implement IPC mechanisms such as pipes, shared memory, and message queues.
6. Write C programs to achieve mutual exclusion using semaphore primitives.
7. Implement Banker's Algorithm in C to prevent deadlock scenarios.
8. Develop a C program to detect deadlocks using deadlock detection algorithm.
9. Write C programs to create and manage multiple threads using POSIX threads (pthreads).
10. Develop C programs to demonstrate:
    i. First Fit
    ii. Best Fit
    iii. Worst Fit memory allocation methods.
11. Write C programs to simulate page replacement policies:
    i. FIFO (First-In-First-Out)
    ii. LRU (Least Recently Used)
    iii. Optimal Page Replacement.
12. Simulate disk scheduling strategies like:

i. FCFS
ii. SSTF (Shortest Seek Time First)
iii. SCAN
iv. C-SCAN.

Total Periods: 45

Course Outcomes:

On completion of the course, the students will be able to

CO1: Demonstrate basic UNIX/Linux commands and shell scripting.
CO2: Apply system calls to create, manage, and synchronize processes and threads in C.
CO3: Implement and analyze various CPU scheduling algorithms and IPC techniques.
CO4: Develop programs to simulate deadlock handling and synchronization.
CO5: Simulate memory allocation methods, paging techniques, and page replacement algorithms.
CO6: Implement disk scheduling techniques using C.

References:

1. https://man7.org/linux/man-pages/
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, 10th Edition, Wiley, 2018.
3. Andrew S. Tanenbaum, Modern Operating Systems, 5th Edition, Pearson, 2022.
4. William Stallings, Operating Systems: Internals and Design Principles, 7th Edition, Prentice Hall, 2018.

Laboratory Requirements:

1. INTEL based desktop PC with min. 8GB RAM and 500 GB HDD, 17" or higher TFT Monitor, Keyboard and mouse
2. Windows 10 or higher operating system / Linux Ubuntu 20 or higher
3. Linux Ubuntu 20 or higher
4. DevC++ / Eclipse CDT / Code Blocks / CodeLite / equivalent open source IDE

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	1	-	-	-	1	3	3	3	2	-	-
CO2	3	1	1	2	2	-	-	-	3	2	1	1	3	-	-
CO3	3	3	2	1	2	-	-	-	3	3	1	2	2	-	-
CO4	1	2	2	3	2	-	-	-	3	1	3	1	2	-	-
CO5	2	2	1	1	3	-	-	-	1	2	2	3	1	-	-
CO6	2	2	2	1	3	-	-	-	2	2	2	3	1	-	-
Avg.	**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**-**	**-**

Course Code	Course Name	Category	L	T	P	C
CS24423	Project Driven Learning	EEC	0	0	2	1

Course Objectives:

- Apply Design Thinking & Problem-Solving Techniques
- Develop and Implement a Structured Project Plan
- Build Functional Prototypes & Minimum Viable Products (MVPs)
- Evaluate Performance & Optimize Solutions
- Present and Deploy Innovative Solutions

UNIT I Ideation & Problem Identification 6

- Icebreaker & Team Formation
  - Tools: Miro, MURAL
- Brainstorming Sessions (Design Thinking, Mind Mapping)
  - Tools: Miro, XMind, Lucidchart
- Understanding User Needs & Problem Validation
  - Tools: Google Forms, Typeform
- Conducting Market Research & Competitor Analysis
  - Tools: Google Trends, Statista, Crunchbase

UNIT II Solution Conceptualization & Planning 6

- Exploring Feasible Solutions (Convergent Thinking)
  - Tools: Miro, FigJam
- Selecting the Tech Stack & Tools
- Creating a Project Timeline (Agile/Scrum Basics)
  - Tools: Jira, Trello
- Sketching Wireframes, Flowcharts, or System Diagrams
  - Tools: Figma, Lucidchart
- Risk Analysis & Contingency Planning
  - Tools: SWOT Analysis Templates, Risk Assessment Matrix

UNIT III Prototyping & Implementation 6

- Creating a Low-Fidelity Prototype (Paper/Digital Mockups)
  - Tools: Figma
- Building a Minimum Viable Product (MVP)
- Testing & Refining the Prototype Based on Feedback
- Implementing Core Functionalities of the Solution
- Code/Design Review & Iteration

UNIT IV Performance Metrics, Benchmarking & Optimization 6

- Defining Key Performance Metrics (KPIs) for the Project
  - Tools: Google Analytics
- Setting Industry Benchmarks & Performance Goals
- Conducting Functional & Usability Testing
  - Tools: Selenium
- Analyzing System Performance & Bottleneck Detection
- Optimizing Code, UI/UX, and Resource Utilization

UNIT V Presentation & Deployment 6

- Crafting a Compelling Pitch (Storytelling, Business Model)
  - Tools: Business Model Canvas, Pitch Deck Templates (Canva, Google Slides)
- Creating a Demo
- Pitching & Receiving Feedback from Mentors/Peers
- Deploying/Publishing the Project
  - Tools: GitHub Pages
- Showcasing the Final Product & Reflection

Total Periods: 30

Course Outcomes:

On completion of the course, the students will be able to

CO1: Finalize a well-defined problem statement and identify key stakeholders
CO2: Develop a structured project plan, defining goals, tech stack, and execution roadmap
CO3: Build a functional prototype with key features working
CO4: Establish clear performance benchmarks, conduct thorough testing, and optimize their project for efficiency, usability, and scalability.
CO5: Successfully present and deploy their projects
CO6: Demonstrate end-to-end project development skills**,** integrating problem-solving, technical implementation, optimization, and presentation to create impactful solutions

Learning Links:

1. Miro Basics
2. Lucidchart Tutorials
3. Figma Wireframing Guide
4. Trello Agile Basics
5. GitHub Basics
6. GitHub Pages Deployment

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	2	-	1	2	2	2	2	1	1	2
CO2	2	2	3	1	2	-	-	-	2	2	3	2	1	1	2
CO3	3	3	3	2	3	-	-	-	2	2	2	2	1	1	2
CO4	3	3	3	3	3	-	-	-	-	-	2	2	1	1	2
CO5	2	2	2	-	2	1	-	1	3	3	2	2	1	1	2
CO6	3	3	3	2	3	2	-	1	3	3	3	3	1	1	2
Avg.	3	3	3	2	3	2	-	1	2	2	2	2	1	1	2

Course Code	Course Name	Category	L	T	P	C
FC24301	Soft Skills	HSMC	2	0	0	1

Course Objectives:

- Understand and apply proper etiquette in social, corporate, and online interactions
- Develop effective verbal and nonverbal communication skills, including body language and posture
- Enhance participation in group discussions and structured professional conversations
- Prepare for job interviews with appropriate etiquette, research, and response techniques
- Communicate professionally in written formats such as emails, inquiries, and job offer letters
- Deliver structured and engaging presentations using storytelling and persuasive techniques

UNIT I Etiquette **6**

Definition

- Social
- Corporate/Business - Meeting
- Telephone
- Netiquette

UNIT II Body Language and Nonverbal Communication 6

- Posture
- Personal grooming
- Facial expression/ gesture/eye contact

UNIT III Group Discussion 6

- Etiquette - Rules of conduct
- GD flow
- Pestel - Political, economic, social, tech, legal, environmental
- Handling unpredictable situation

UNIT IV Job Interview – Etiquette 6

- Pre-interview prep and research
- Responding to non technical questions (star model - situation/task/ action plan/ result)
- Speaking your resume
- Writing inquiries and responding to job offer letters

UNIT V Presentation skills 6

- Setting the tone/ storytelling
- JAM/ Turn your Court

Total Periods: 30

Course Outcomes:

CO1: Demonstrate professionalism in meetings, telephone calls, and digital communication
CO2: Use appropriate body language, facial expressions, and gestures to enhance communication
CO3: Participate effectively in group discussions, debates, and structured dialogues
CO4: Apply job interview strategies, including answering behavioral questions using the STAR model
CO5: Write clear and professional business correspondence, including inquiries and job offers
CO6: Present ideas confidently with a structured approach, engaging tone, and strong delivery

Suggested Activities

1. **Role-Playing Business Meetings** – Students are assigned different corporate roles (CEO, Manager, Employee) and have them conduct a mock meeting with proper etiquette.
2. Group Discussion
3. **PESTEL Case Study** – Students analyze a real-world company using PESTEL factors and present their findings.
4. **Resume Pitching** – Students present their resumes as a story, explaining their achievements in an engaging way.
5. **Turn the Court Debate Organizer** – Students list arguments for and against a topic to prepare for persuasive speaking.

Work Sheets:

1. Business Meeting Etiquette Checklist – A checklist where students identify correct/incorrect meeting behaviors.
2. PESTEL Case Study Template – A table where students analyze a company using Political, Economic, Social, Technological, Environmental, and Legal factors.
3. STAR Method Interview Worksheet – Students write answers to common behavioral questions using the situation, Task, Action, Result format.

References:

1. Pachter, Barbara. The Essentials of Business Etiquette: How to Greet, Eat, and Tweet Your Way to Success. McGraw-Hill, 2013.
2. Pease, Allan, and Barbara Pease. The Definitive Book of Body Language. Bantam, 2004.
3. Gage, Martha. The Power of STAR Method: How to Succeed at Behavioral Job Interviews. Independently published, 2019.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
Avg.	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-

Course Code	Course Name	Category	L	T	P	C
HS24321	Communication Skills Building Laboratory	HSMC	0	0	2	1

Course Objectives:

- Develop the ability to construct grammatically correct and contextually appropriate sentences
- Enhance critical thinking skills for analyzing and interpreting texts, media, and experiences
- Strengthen comprehension, summarization, and documentation skills for professional contexts
- Improve verbal and non-verbal communication for effective interaction in diverse professional settings
- Equip learners with teamwork, networking, and interview skills essential for career advancement
- Enable the creation of a professional digital identity through resumes, LinkedIn profiles, and self-presentation techniques

UNIT I The Art of Discourse **6**

- **Listening:** Listen to stand-up comedy, political commentaries, and campaigns for appreciative listening.
- **Reading:** Read and evaluate business and economic news articles; determine tone (neutral, positive, negative) and fact-check.
- **Writing:** Craft commentary and opinion pieces to persuade or provoke discussion.
- **Speaking:** Explain satire comic strips (e.g., Amul advertisements, political cartoons)

UNIT II Professional Communication Essentials 6

- **Listening**: Listen to voicemail, messages, and fill out forms.
- **Reading**: Compare products & services; analyze advertisements.
- **Writing**: Draft meeting agendas and minutes.
- **Speaking**: Engage in open-field group discussions.

UNIT III Documentation and Summation 6

- **Listening:** Listen to documentaries, book summaries, and movie summaries for comprehensive understanding.
  Reading: Read and analyze reports on significant events (e.g., environmental disasters, economic downturns).
- **Writing:** Write survey reports and paraphrase key information.
- **Speaking:** Report news, weather forecasts, and predictions.

UNIT IV Refining Professional Competence 6

- **Listening:** Translate informal language into formal business communication (Contextual translation)
- **Reading:** Read and interpret technical texts and industry-specific jargon.
- **Writing:** Write cover letters and statements of purpose.
- **Speaking:** Role-play professional etiquette in workplace scenarios (e.g., expressing empathy, kindness, courtesy).

UNIT V Developing a Professional Profile 6

- **Listening:** Listen to podcasts, Josh Talks, and professional interviews.
- **Reading**: Analyze professional resumes and LinkedIn profiles.
- **Writing**: Set up a LinkedIn profile and write engaging posts.
- **Speaking**: Conduct mock interviews and deliver an effective elevator pitch.

Total Periods:30

Course Outcomes:
C01: Construct coherent and professional sentences tailored to various workplace scenarios
C02: Analyze and critically interpret professional texts and multimedia content
C03: Document, summarize, and report information effectively across multiple formats
C04: Communicate effectively in professional and social interactions
C05: Demonstrate teamwork, networking, and interview skills relevant to career development
C06: Curate a professional online presence through resume development - LinkedIn, Indeed, .

Suggested Activities:

1. Documentation and Summation
   Assignment: Newsroom Simulation (20 Marks)
   - Students record a 2-minute news report on an environmental/economic issue.
   - Must include paraphrased content from real news reports (cite sources).
   - Submission: Video + written news script.
2. Group Discussion (30 Marks)
3. Refining Professional Competence
   Assignment: Corporate Dilemma Roleplay (20 Marks)
   - Scenario-based role play on professional etiquette (handling client complaints, rejecting proposals kindly, etc.).
   - Each student submits a formal email responding to the scenario professionally.
4. Developing a Professional Profile

Assignment: LinkedIn Challenge (30 Marks)

- Students create or optimize their LinkedIn profile and write a compelling post (e.g., career reflections, lessons from a recent project).
- Submit a screenshot of updated profile + link to post.
- Optional: Engage with at least three classmates' posts with meaningful comments.

Text Books:

1. English for Engineers and Technologists. Volume I by Orient Blackswan, 2022
2. English for Science & Technology - I by Cambridge University Press, 2023

References:

1. Seely, John. Oxford Guide to Effective Writing and Speaking: How to Communicate Clearly. Oxford University Press, 2013.
2. Cottrell, Stella. Critical Thinking Skills: Developing Effective Analysis and Argument. Bloomsbury Academic, 2017.
3. Bhatnagar, Nitin. Communicative English for Professional Courses. Pearson, 2010.
4. Guffey, Mary Ellen, and Dana Loewy. Essentials of Business Communication. Cengage Learning, 2021.
5. Collins, Patrick. Speak with Power and Confidence: Tested Ideas for Becoming a More Powerful Communicator. Prentice Hall, 2009.
6. Locker, Kitty O., and Stephen Kyo Kaczmarek. Business Communication: Building Critical Skills. McGraw-Hill, 2020.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	1	-	1	1	1	1	-	-	-	-
CO2	-	1	-	1	-	-	-	-	1	1	-	1	-	-	-
CO3	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-
CO4	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	1	1	-	1	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Avg.	-	-	-	-	-	1	-	1	1	1	1	-	-	-	-