PSG INSTITUTE OF TECHNOLOGY AND APPLIED RESEARCH
COIMBATORE – 641 062

(Autonomous Institution Affiliated to Anna University)

2025 Regulations
Scheme of Assessment and Syllabi
(for First and Second Semesters)

For

B.E. Robotics and Artificial Intelligence

B.E. Robotics and Artificial Intelligence

Vision

To create a vibrant ecosystem of innovators in Robotics and Autonomous Systems by designing transformative learning experiences that empower future engineers and innovators to ethically solve complex global challenges and serve industry and society.

Mission

- To provide rigorous education and cutting-edge research opportunities in Robotics, and Autonomous Systems, enabling graduates to excel in emerging technological domains.
- To foster innovation, critical thinking, and multidisciplinary problem-solving through experiential learning, hands-on laboratory practices, robotic system design, AI-driven applications, and real-world engineering projects.
- To promote research, entrepreneurship, and industry–academia collaboration in areas such as intelligent robotics, machine learning, computer vision, autonomous mobility, and smart systems for technological advancement and societal benefit.
- To cultivate ethical values, sustainability awareness, and lifelong learning among students, empowering them to develop reliable, human-centric, and socially responsible autonomous technologies.

Program Educational Objectives (PEOS)

Graduates are expected to perform and achieve during the first few years after graduation

PEO 1 – Innovation and Impact: Graduates will architect and implement intelligent robotic systems and AI-driven solutions that enhance industrial productivity, improve quality of life, and address emerging global needs.

PEO 2 – Career Advancement and Expertise: Graduates will establish themselves as competent professionals, researchers, or entrepreneurs by continuously upgrading their technical expertise in rapidly evolving intelligent technologies.

PEO 3 – Leadership in Multidisciplinary Environments: Graduates will excel in diverse professional settings by demonstrating collaborative spirit, effective communication, project leadership, and sound decision-making abilities.

PEO 4 – Ethical and Sustainable Practice: Graduates will uphold integrity, social responsibility, and sustainability principles while developing and deploying autonomous and intelligent systems.

Revised Program Outcomes (POs)

PO1- Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop the solution of complex engineering problems.

PO2- Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3- Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4-Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)

PO5- Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6- The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)

PO7-Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8-Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams

PO9-Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10-Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11-Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (PSOs)

Students expected to know and be able to perform in a specialized area of discipline upon graduation from a program.

PSO 1: Robotics and AI System Development: Graduates will be able to design, develop, and implement robotics and artificial intelligence solutions by applying principles of sensing, embedded systems, programming, machine learning, and intelligent control to address engineering problems.

PSO 2: Intelligent and Autonomous Systems Engineering: Graduates will be able to analyze, integrate, and evaluate autonomous robotic systems using modern tools and techniques in computer vision, data analytics, optimization, and human–machine interaction for industrial and societal applications.

B.E. ROBOTICS AND ARTIFICIAL INTELLIGENCE

(Minimum No. of credits to be earned: 168)

S. No.	Course Code	Course Title	Hours /Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER I										
THEORY										
1	25MA101	Calculus and Its Applications	3	1	0	4	40	60	100	BS
2	25PH105	Engineering Physics	3	0	0	3	40	60	100	BS
3	25EE103	Foundations of Electrical and Electronic Systems	3	0	0	3	40	60	100	ES
4	25RA101	Algorithmic Thinking with C	3	0	0	3	40	60	100	ES
5	25HS101	English Language Proficiency	3	1	0	4	40	60	100	HS
6	25HS102	தமிழர் மரபு / Heritage of Tamils	1	0	0	1	40	60	100	HS
PRACTICALS										
7	25GE111	Design Thinking for Innovation	0	0	2	1	100	0	100	ES
8	25PH111	Physics Laboratory	0	0	4	2	60	40	100	BS
9	25RA111	C Programming Laboratory	0	0	2	1	60	40	100	ES
10	25EE111	Foundations of Electrical and Electronics Laboratory	0	0	4	2	60	40	100	ES
MANDATORY COURSES										
11	25GEM01	Induction Programme**	-	-	-	Grade	-	-	-	MC
12	25HSO01/ 25HSO02	Physical Education/Yoga and Health	0	0	2	Grade	-	-	-	MC
Total 32 Periods			**16**	**2**	**14**	**24**	**520**	**480**	**1000**	

S. No.	Course Code	Course Title	Hours/Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER II										
THEORY										
1	25MA201	Complex Variables and Transforms	3	1	0	4	40	60	100	BS
2	25RA201	Foundations of Robotics and AI	3	0	0	3	40	60	100	PC
3	25RA202	Fundamentals of Engineering Mechanics	3	1	0	4	40	60	100	PC
4	25RA203	Sensors, Transducers and Signal Conditioning	3	0	0	3	40	60	100	ES
5	25RA204	Computational Problem Solving with Python	3	0	0	3	40	60	100	ES
6	25HS201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	40	60	100	HS
PRACTICALS										
7	25RA211	Robot Design and Prototyping Laboratory	0	0	4	2	60	40	100	PC
8	25RA212	Engineering Drawing with CAD	0	0	4	2	60	40	100	ES
9	25RA213	Problem Solving and Python Programming Laboratory	0	0	2	1	60	40	100	ES
10	25HS21_	Language Elective	0	0	4	2	60	40	100	HS
11	25EEC01	Workplace Communication Skills	0	0	2	Grade	100	0	100	EEC
MANDATORY COURSES										
12	25GEM02	Activity Point Programme I*	-	-	-	Grade	-	-	-	MC
13	25HSO01/ 25HSO02	Physical Education/Yoga and Health	0	0	2	Grade	-	-	-	MC
Total 36 Periods			**16**	**2**	**18**	**25**	**580**	**520**	**1100**	

**** As per AICTE Norms,**

*** As per AICTE Norms Total: 60 Hours, Grade: Non - Credit Course;**

CA - Continuous Assessment; ESE - End-Semester Examination; CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE - Open Elective; EEC - Employability Enhancement Course; MC - Mandatory Course

L-Lecture; T-Tutorial; P-Practical; C-Credits

S. No.	Course Code	Course Title	Hours /Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER III										
THEORY										
1	25MA302	Linear Algebra	3	1	0	4	40	60	100	BS
2	25RA301	Mechanics and Materials	3	1	0	4	40	60	100	PC
3	25RA302	Digital Electronics and Microcontrollers	3	0	0	3	40	60	100	ES
4	25RA303	Data Structures and Algorithms	3	0	0	3	40	60	100	ES
5	25HS301	Project and Finance Management	3	0	0	3	40	60	100	HS
PRACTICALS										
6	25RA311	Electronic Circuits and Sensors Laboratory	0	0	4	2	60	40	100	PC
7	25RA312	Data Structures and Algorithms Laboratory	0	0	2	1	60	40	100	ES
8	25RA313	Modeling Laboratory	0	0	4	2	60	40	100	PC
9	25EEC02	Foundations of Problem Solving	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
10	25MC0_ _	Mandatory Course I	2	0	0	Grade	100	0	100	MC
11	25GEM03	Activity Point Programme II*	-	-	-	Grade	-	-	-	MC
Total 31 Periods			**17**	**2**	**12**	**23**	**580**	**420**	**1000**	

S. No.	Course Code	Course Title	Hours /Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER IV										
THEORY										
1	25MA405	Probability and Statistics	3	1	0	4	40	60	100	BS
2	25RA401	Kinematics and Dynamics of Machines	3	1	0	4	40	60	100	PC
3	25RA402	Power Electronics and Drives	3	0	0	3	40	60	100	PC
4	25RA403	AI for Robotics	3	0	0	3	40	60	100	PC
5	25RA404	Embedded Systems and Programming	3	0	0	3	40	60	100	PC
PRACTICALS										
6	25RA411	Robotic Operating System Laboratory	0	0	2	1	60	40	100	PC
7	25RA412	Embedded Systems and Programming Laboratory	0	0	2	1	60	40	100	PC
8	25EEC03	Problem Solving	0	0	2	1	100	0	100	EEC
9	25RAE01	Mini Project - I	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
10	25MC0_ _	Mandatory Course II	2	0	0	Grade	100	0	100	MC
11	25GEM04	Activity Point Programme III*	-	-	-	Grade	-	-	-	MC
Total 26 Periods			**17**	**2**	**8**	**21**	**620**	**380**	**1000**	

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S. No.	Course Code	Course Title	Hours /Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER V										
THEORY										
1	25RA501	Machine Intelligence	3	0	0	3	40	60	100	PC
2	25RA502	Design of Mechanical Systems for Robotics	3	1	0	4	40	60	100	PC
3	25RA503	Industrial Automation and IIoT	3	0	0	3	40	60	100	PC
4	25RA504	Robotic Control Systems	3	1	0	4	40	60	100	ES
5	25RAP_ _	Professional Elective I	3	0	0	3	40	60	100	PE
PRACTICALS										
6	25RA511	Industrial Automation Laboratory	0	0	4	2	60	40	100	PC
7	25RA512	Industrial Robots System Engineering Laboratory	0	0	4	2	60	40	100	ES
8	25RAE02/ 25RAE03	Internship I / Community Project	0	0	0	1	100	0	100	EEC
9	25EEC04	Aptitude Skills	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
10	25GEM05	Activity Point Programme IV*	-	-	-	Grade	-	-	-	MC
Total 27 Periods			**15**	**2**	**10**	**23**	**520**	**380**	**900**	

S. No.	Course Code	Course Title	Hours / Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER VI										
THEORY										
1	25RA601	Engineering Optimization and Decision Methods	3	1	0	4	40	60	100	ES
2	25RA602	Robotic Vision and Intelligence	3	0	0	3	40	60	100	PC
3	25RA603	Industry X.0	3	0	0	3	40	60	100	PC
4	25RAP_ _	Professional Elective II	3	0	0	3	40	60	100	PE
5	25_ _O_ _	Open Elective I	3	0	0	3	40	60	100	OE
PRACTICALS										
6	25RA611	Industrial Motion and Control Systems Laboratory	0	0	4	2	60	40	100	PC
7	25RA612	Applied AI and Optimization Laboratory	0	0	4	2	60	40	100	PC
8	25EEC05	Enhance Problem-Solving with Code	0	0	2	1	100	0	100	EEC
9	25RAE04	Mini Project II	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
10	25GEM06	Activity Point Programme V*	-	-	-	Grade	-	-	-	MC
Total 29 Periods			**15**	**2**	**12**	**22**	**520**	**380**	**900**	

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S. No.	Course Code	Course Title	Hours / Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER VII										
THEORY										
1	25RA701	Autonomous Systems	3	0	0	3	40	60	100	PC
2	25RA702	Robot System Design	3	0	0	3	40	60	100	PC
3	25RAP_ _	Professional Elective III	3	0	0	3	40	60	100	PE
4	25RAP_ _	Professional Elective IV	3	0	0	3	40	60	100	PE
5	25_ _O_ _	Open Elective II	3	0	0	3	40	60	100	OE
PRACTICALS										
6	25RA711	Autonomous Systems Laboratory	0	0	4	2	60	40	100	PC
7	25RAE05	Project Work I	0	0	4	2	100	0	100	EEC
8	25RAE06	Internship II	0	0	0	1	100	0	100	EEC
Total 23 Periods			**15**	**0**	**8**	**21**	**460**	**340**	**800**	

S. No.	Course Code	Course Title	Hours /Week			C	Maximum Marks			CAT
			L	T	P		CA	ESE	Total	
SEMESTER VIII										
THEORY										
1	25RAP_ _	Professional Elective V	3	0	0	3	40	60	100	PE
2	25RAP_ _	Professional Elective VI	3	0	0	3	40	60	100	PE
PRACTICALS										
3	25RAE07	Project Work II	0	0	8	4	60	40	100	EEC
	Total 14 Periods		**6**	**0**	**8**	**10**	**140**	**160**	**300**	

SUMMARY OF CREDIT DISTRIBUTION

B.E. ROBOTICS AND ARTIFICIAL INTELLIGENCE									
S. No.	Course Category	Credits Per Semester							Total Credits
		1	2	3	4	5	6	7	8	
1	HS	5	3	3	0	0	0	0	0	11
2	BS	9	4	4	4	0	0	0	0	21
3	ES	10	9	7	0	3	4	0	0	33
4	PC	0	9	8	15	15	10	8	0	65
5	PE	0	0	0	0	3	3	6	6	18
6	OE	0	0	0	0	0	3	3	0	6
7	EEC	0	0	1	2	2	2	3	4	14
8	MC	-	-	-	-	-	-	-	-	-
TOTAL		**24**	**25**	**23**	**21**	**23**	**22**	**20**	**10**	**168**

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L-Lecture; T-Tutorial; P-Practical; C-Credits

LIST OF PROFESSIONAL ELECTIVE COURSES: VERTICALS

S. No.	VERTICAL I Service and Field Robotics	VERTICAL II Industrial Automation	VERTICAL III Drone and Autonomous Systems	VERTICAL IV Diversified
1	25RAP01 Underwater Robotics	25RAP09 Digital Control Systems	25RAP17 Aerodynamics of Drones	25RAP25 Smart Material of Robotics
2	25RAP02 Medical Robotics	25RAP10 Advanced Control Systems	25RAP18 Drone Design and Development	25RAP26 Direct Digital Manufacturing
3	25RAP03 Mobile and Micro-robotics	25RAP11 Robotic Welding Technology	25RAP19 AI in Drones	25RAP27 Advanced Driver Assistance Systems
4	25RAP04 Soft Robots	25RAP12 Intelligent Manufacturing	25RAP20 UAV Communication Systems	25RAP28 Humanoid Robot
5	25RAP05 Nano Robots	25RAP13 Assembly Automation	25RAP21 Autonomous UAV Navigation	25RAP29 Reinforcement Learning
6	25RAP06 Swarm Robots	25RAP14 Dark Factories	25RAP22 Drone Mapping & GIS	25RAP30 Virtual and Augmented Reality
7	25RAP07 Robot Gripper Design	25RAP15 Cyber Physical Systems	25RAP23 Multi UAV Autonomy	25RAP31 Cloud Robotics
8	25RAP08 Farm Robots	25RAP16 Industrial Networking	25RAP24 Reinforcement Learning for UAV control	25RAP32 Autonomous and Connected Vehicles

LIST OF COURSES FOR MINOR DEGREE PROGRAMME IN ROBOTICS AND AUTONOMOUS SYSTEMS

S. No.	Course Code	Course Title
1	25RAM01	AI for Factory Automation
2	25RAM02	AI Ethics and Standards
3	25RAM03	Human-Robot Interaction
4	25RAM04	Autonomous Navigation Systems
5	25RAM05	Multi-Robot Systems
6	25RAM06	Robot Assisted Additive Manufacturing
7	25RAM07	Robotic Operating System and SLAM
8	25RAM08	Industrial Robot and Digital Manufacturing

LIST OF LANGUAGE ELECTIVE COURSES

S. No.	Course Code	Course Title
1	25HS211	Communication Skills for Engineers
2	25HS212	Basic German
3	25HS213	Basic Japanese

LIST OF MANDATORY COURSES

S. No.	Course Code	Course Title
1	25MC001	Environmental Sciences
2	25MC002	Indian Constitution
3	25MC003	Industrial Safety
4	25MC004	Disaster Risk Reduction and Management
5	25MC005	Indian Knowledge System for Sustainable Human Development
6	25MC006	Strategic Data Management and Governance
7	25MC007	Professional Ethics
8	25HSO01	Physical Education
9	25HSO02	Yoga and Health

SEMESTER I

25MA101 CALCULUS AND ITS APPLICATIONS
(Common to All B.E./B.Tech. Degree Programmes)

3 1 0 4

DIFFERENTIAL CALCULUS: Functions of two variables, limits and continuity, partial derivatives, chain rule, extreme values and saddle points, Lagrange multipliers, Taylor's formula for two variables. **(9+3)**

INTEGRAL CALCULUS: Double and iterated integrals over rectangles, double integrals over general regions, Fubini's theorem, area and volume by double integration, reversing the order of integration, double integrals in polar form. **(9+3)**

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS: Basic concepts, separable differential equations, exact differential equations, integrating factors, linear differential equations, modeling - mixing problems, Newton's law of cooling, decay and growth problems. **(9+3)**

SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS: Homogeneous linear equations of second order, homogeneous linear ODEs with constant coefficients, Euler–Cauchy equations, solution by variation of parameters, free oscillations mass spring systems, electric circuits. **(9+3)**

VECTOR CALCULUS: Gradient and directional derivative of a scalar field, divergence and curl of a vector field. Integration in vector field – line integrals, path independence of line integrals, Green's theorem in the plane, divergence theorem of Gauss and Stokes' theorem. **(9+3)**

Total L: 45 + T: 15 = 60 Periods

TEXT BOOKS:

1. J. Hass, C. Heil, and D.W. Maurice, '*Thomas Calculus*'. Pearson Education, New Delhi, 2018.
2. Erwin Kreyszig, '*Advanced Engineering Mathematics*'. Wiley India, New Delhi, 2018.

REFERENCES:

1. H. Anton, I. Bivens, and S. Davis, '*Calculus*'. John Wiley and Sons, USA, 2016.
2. C. R. Wylie and L.C. Barrett, '*Advanced Engineering Mathematics*'. Tata McGraw-Hill, New Delhi, 2019.
3. D.G. Michael, '*Foundations of Applied Mathematics*'. Dover Publications, New York, 2013.
4. Gilbert Strang, '*Calculus*'. Wellesley Cambridge Press, USA, 2017.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts related to calculus, differential equations, and Vector Calculus.	**K2**
CO2	Apply the techniques of Calculus, Differential Equations and Vector Calculus to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Calculus, Differential Equations and Vector Calculus.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Calculus, Differential Equations and Vector Calculus.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3												
CO3		1											
CO4					1								
	3	**1**			**1**								

1-Low, 2-Medium, 3-High,

25PH105 ENGINEERING PHYSICS

3 0 0 3

MECHANICS: Review of Vector quantities - Inertial mass - Newton's third law and Free Body diagrams - Rigid body dynamics: Centre of mass - Moment of inertia - Torque, angular momentum and angular acceleration - Work, power and energy - Conservation of momentum and energy - Elastic and inelastic collisions - Kinetic energy considerations. Circular motion: Radial and tangential forces - Centripetal acceleration and centripetal force. **(9)**

OSCILLATORY AND WAVE MOTION: Simple harmonic motion - differential equation of SHM, Vibration of a spring and mass system – Resonance - Analogy with LCR circuits - Energy and energy loss - Vibration and vibration isolation – Wave motion: Definition and Differential equation of a plane progressive wave (2D) - Attenuation, Solution of the differential equation of a plane progressive wave. **(9)**

ELECTROMAGNETISM: Magnetic fields - Electromagnetic induction - Expression for induced emf - Electric fields: definition of fundamental terms - Dielectric polarization – Frequency dependence - Dielectric constant - Electromagnetic waves - Propagation of electromagnetic waves through isotropic media - Maxwell's equations and interpretation of Maxwell's equations. **(9)**

LASERS AND FIBER OPTICS: Properties of lasers, Spontaneous and Stimulated emission of radiation - Einstein's A & B coefficient, Population inversion - Components of Laser, Engineering applications of lasers - CO_2 laser – Diode Laser - Fiber Optics - propagation of light through optical fiber - numerical aperture and acceptance angle - Engineering applications of fiber. **(9)**

SENSORS FOR ROBOTICS: Classification of sensors and characteristics, Touch, proximity sensors, and displacement sensors - Hall effect sensors - Optical sensors: IR, Photodiodes - Inertial sensors: Gyroscopes, Accelerometer - Force sensors - Torque sensors - Range sensors: IR, Ultrasonic sensors, laser ranger finder - MEMS sensors - Piezoelectric sensors - Resistive sensors (strain gauge, RTD, thermistor) and Capacitive/ inductive sensors, Haptic feedback sensors. **(9)**

Total L: 45 Periods

TEXT BOOKS:

1. Richard Wolfson, '*Essential University Physics*'. 3rd Edition, Pearson Education, Singapore, 2016.
2. Nelson A, '*Engineering Mechanics: Statics and Dynamics*'. 1st Edition, McGraw Hill Education, 2007.
3. M. N. Avadhanulu, P G Kshirsagar, T V S Arun Murthy, *'A Text book of Engineering Physics*'. S. Chand & Co. 11th Edition, 2019.
4. Beiser, '*Concepts of Modern Physics*'. Tata McGraw Hill, New Delhi, 2003.
5. Nathan Ida, '*Sensors, Actuators, and Their Interfaces: A Multidisciplinary Introduction*'. 2nd Edition, 2020.

REFERENCES:

1. E. M. Purcell, '*Electricity and Magnetism – Berkeley Physics Course'*. Tata McGraw-Hill, 2017.
2. Ajoy Ghatak and K. Thyagarajan, '*An Introduction to Fiber Optics*'. Cambridge University Press, 1998.
3. Dr. M. N. Avadhanulu and Dr. R. S. Hemne, *'An Introduction to Lasers: Theory and Applications*'.
4. S. Chand Publications, 2008.
5. R. Gaur and S. L. Gupta, '*Engineering Physics*'. Dhanpat Rai Publications, 2010.
6. D Halliday, R Resnick and Walker, '*Fundamentals of Physics*'. John Wiley and Sons, 12th edition, 2021.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the fundamental principles of mechanics, oscillatory and wave motion, electromagnetism, lasers, fiber optics, and sensors relevant to engineering applications.	**K2**
CO2	Apply concepts of mechanics, waves, electromagnetism, lasers, fiber optics, and sensors to solve basic engineering physics problems.	**K3**
CO3	Analyze physical systems involving motion, energy transfer, electromagnetic phenomena, optical systems, and sensor behavior for engineering applications.	**K4**
CO4	Present engineering physics concepts as seminars, assignments, or technical reports.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3	3											
CO3	2	1											
CO4	1	1				1			1		1		
	2	2				1			1		1		

1-Low, 2-Medium, 3-High

25EE103 FOUNDATIONS OF ELECTRICAL AND ELECTRONIC SYSTEMS

3 0 0 3

ELECTRICAL SYSTEMS FUNDAMENTALS: Electrical quantities and SI units – Charge, Voltage, current, resistance, power – Ohm's law – Kirchhoff's laws – Mesh and Nodal Analysis for DC circuits - Series parallel combination of R, L and C components, Voltage Divider and Current Divider Rules – AC fundamentals – Instantaneous, RMS and average values – Power, Power factor and Energy. **(10)**

DC MACHINES: Types of DC motors, Construction and Principle of operation: Shunt motor - Brushless DC motor- Speed-torque characteristics, Starting, Speed Control, and Braking. **(8)**

AC AND SPECIAL MACHINES: Single-phase and three-phase transformers: Construction - connections-Types of AC motors - Construction and working: single-phase and three-phase induction motor - Synchronous motor – Special Machines: Variable reluctance stepper motor- Linear motor- DC and AC servo motors. **(10)**

ELECTRONIC DEVICES: Semiconductor fundamentals – PN junction diode – Rectifier circuits – Zener diode and voltage regulation – BJT: operation and switching – MOSFET: working and characteristics – Datasheet parameters of diodes, BJTs, and MOSFETs: ratings, characteristics, and safe operating area. **(9)**

ELECTRONIC CIRCUITS: Half wave and full wave rectifiers: analysis, ripple factor, filtering – Clippers and Clampers – Zener voltage regulator- series voltage regulators – RC coupled amplifier. **(8)**

Total L: 45 Periods

TEXT BOOKS:

1. A William Hayt, Jack Kemmerly, Jaime Phillips and Steven Durbin, '*Engineering Circuit Analysis'*. Tata McGraw Hill, New Delhi, 2019.
2. D.P. Kothari and I.J. Nagrath, '*Basic Electrical and Electronics Engineering'*. Tata McGraw Hill, New Delhi, 2014.

REFERENCES:

1. Charles Alexander and Mathew Sadiku, '*Fundamentals of Electric Circuits'*. Tata McGraw Hill, New Delhi, 2021.
2. V.N. Mittle and Aravind Mittal, '*Basics of Electrical Engineering'*. Tata Mc Graw Hill, New Delhi, 2017.
3. Warsame Hassan Ali, Samir Ibrahim Abood and Matthew N. O. Sadiku, '*Fundamentals of Electric Machines*'. CRC press, New York, 2019.
4. Robert L. Boylestad and Louis Nashelsky, '*Electronic Devices and Circuit Theory'.* Pearson, New Delhi, 2013.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the working principles of electrical machines, electronic devices, and digital circuits.	**K2**
CO2	Apply electrical, electronics, and digital fundamentals to solve simple circuit problems.	**K3**
CO3	Demonstrate an application of electrical and electronic circuits as a team using any simulation tool.	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	
CO3		1			1							3	
	3	1			1							3	

1-Low, 2-Medium, 3-High

25RA101 ALGORITHMIC THINKING WITH C

3 0 0 3

ALGORITHMIC THINKING AND COMPLEXITY BASICS: Introduction to the problem-solving framework: problem decomposition, logical design, algorithm and flowchart, sequential tracing; Concept of computational efficiency; Introduction to Time Complexity and Space Complexity. **(9)**

DATA REPRESENTATION AND CORE CONTROL FLOW: Character sets, identifiers, keywords, and naming conventions; Standard and fixed-width primitive data types; Preprocessor directives and symbolic constants; Operators, expressions, and evaluation precedence; Input and Output abstractions; Control constructs: conditional statements for branching logic, and looping constructs. **(9)**

MODULAR ARCHITECTURE AND MEMORY OVERHEADS: Library and user-defined functions for modular program design; Parameter passing mechanisms: call-by-value and call-by-reference; Scope of variables and macros; Storage class specifiers (auto, register, static, extern); Introduction to pointers: pointer variables, pointer operations. Foundational concepts of recursion versus iteration **(10)**

DATA STRUCTURES AND ALGORITHM COMPARISON: One-dimensional and multi-dimensional arrays, Array processing operations and passing arrays to functions; Basic string manipulation and string handling operations**.** **(9)**

USER-DEFINED TYPES AND STORAGE: Structures and nested structures, Arrays of structures, passing structures to functions – Enumerated data types –File handling: opening, closing, reading and writing files. **(8)**

Total L: 45 Periods

TEXT BOOKS:

1. Karl Beecher, '*Computational Thinking: A Beginner's Guide to Problem Solving and Programming'*. BCS Learning & Development Ltd., 2017.
2. Reema Thareja, '*Introduction to C Programming'*. Third Edition, Oxford University Press, 2023.

REFERENCES:

1. Dromey R. G., '*How to solve it by computer'*. Pearson India, 2007.
2. B.W. Kernighan and D.M. Ritchie, '*The C Programming Language*'. Second Edition, Prentice Hall, 1988.
3. Behrouz A. Forouzan and Richard F. Gilberg, '*Computer Science: A Structured Programming Approach Using C*'. Fourth Edition, Cengage Learning, 2015.
4. Yashavant Kanetkar, '*Let Us C*'. Twenty-First Edition, BPB Publications, 2025.
5. Ashok Kamthane, '*Programming in C*'. Second Edition, Pearson Education India, 2013.
6. Byron S. Gottfried, '*Schaum's Outline of Programming with C*'. Second Edition, McGraw Hill, 2022.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the core syntax, memory organization, data types, and structural building blocks of a procedural programming language.	**K2**
CO2	Implement structured control flows, modular functions, and user-defined data arrangements to solve real-world logical problems.	**K3**
CO3	Analyze the performance of simple algorithms in terms of execution time and memory requirements.	**K4**
CO4	Evaluate candidate programming approaches and data handling mechanisms to justify optimal selections under strict processing constraints	**K5**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3												
CO3		3											
CO4			2	1	1						1		
	3	**3**	**2**	**1**	**1**						**1**		

1-Low, 2-Medium, 3-High

25HS101 ENGLISH LANGUAGE PROFICIENCY
(Common to All B.E./B.Tech. Degree Programs)

3 1 0 4

VOCABULARY: Etymology-Prefixes and suffixes–Synonyms–Antonyms–Guessing meanings from context–Word formation- Single-word substitutes- Different forms of a word–Phrasal verbs–Collocations. **(9+3)**

LISTENING AND SPEAKING: Understanding listening – Listening techniques - Introducing oneself and others –Seeking and sharing information– Description-Conversation skills– Extempore speaking– Speech practice in varied formal contexts. **(9+3)**

GRAMMAR: Wh-questions – Yes/no questions– Parts of speech – Articles– Prepositions–Gerunds–Conjunctions-Degrees of comparison– Tenses– Modal verbs – Adverbs - Direct and indirect questions. **(9+3)**

READING: Reading strategies: Skimming and scanning, predicting– Reading comprehension: techniques – Practice reading. **(9+3)**

WRITING: Discourse markers – Dialogue writing - Completing sentences – Jumbled sentences – Paragraph writing –Writing compare & contrast paragraphs – Letter writing. **(9+3)**

Total L: 45 + T: 15 = 60 Periods

TEXTBOOKS:

1. K.N. Shoba and Lourdes Joavani Rayen, '*Communicative English*'. Cambridge University press, Cambridge, 2021.
2. Raymond Murphy, '*Intermediate English Grammar*'. Cambridge University Press, New Delhi, 2020.
3. Dr M. Sambaiah, '*Technical English an integrated text book*'. Wiley India Pvt. Ltd., 2025.

REFERENCES:

1. Raymond Murphy, '*English Grammar in Use*'. Cambridge University Press, New Delhi 2020.
2. N.P. Sudharshana and C. Savitha, '*English for Engineers*'. Cambridge University Press, New York, 2018.
3. Helen Naylor with Raymond Murphy, '*Essential English Grammar*'. Cambridge University Press, New Delhi, 2019.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate the ability to recognize and use a wide range of vocabulary and key grammatical structures accurately, while developing inferential reading skills to comprehend, interpret, and analyze written texts across diverse contexts.	**K2**
CO2	Organize their ideas logically in essay writing, develop paragraphs with clear topic sentences and adapt their letter-writing skills to various real-world scenarios.	**K3**
CO3	Develop and demonstrate clear and confident speaking skills in formal and informal contexts.	**-**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1									3				
CO2									3				
CO3									3		2		
									3		**2**		

1-Low, 2-Medium, 3-High

25HS102 *தமிழர் மரபு*
(Common to all B.E./B.Tech./B.Des. Degree Programmes)

1 0 0 1

மொழி மற்றும் இலக்கியம்: *இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச்சார் பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க்காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.* **(3)**

மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக்கலை: *நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரி முனையில் திருவள்ளுவர் சிலை – இசைக்கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வியல் கோவில்களின் பங்கு.* **(3)**

நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்: *தெருக்கூத்து, கரகாட்டம், வில்லுப் பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.* **(3)**

தமிழர்களின் திணைக்கோட்பாடுகள்: *தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்க கால நகரங்களும் துறைமுகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.* **(3)**

இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: *இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப் பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப் படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.* **(3)**

Total L: 15 Periods

25HS102 HERITAGE OF TAMILS
(Common to all B.E./B.Tech./B.Des. Degree Programmes)

1 0 0 1

LANGUAGE AND LITERATURE: 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. **(3)**

HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE: 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. **(3)**

FOLK AND MARTIAL ARTS: Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamil. **(3)**

THINAI CONCEPT OF TAMILS: 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 Chola. **(3)**

CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE: 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. **(3)**

Total L: 15 Period

TEXT – CUM – REFERENCE BOOKS:

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

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the Dravidian language family, outline the features of Tamil classical literature, and explain the development of Tamil art, sculpture, and temple-related traditions in a historical context.	**K2**
CO2	Demonstrate the cultural relevance of Tamil folk and martial arts, apply the concepts of Sangam landscape classification to social contexts, and relate Tamil contributions to India's freedom struggle, cultural legacy, and Siddha medicine.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1							3				3		
CO2							3				3		
							3				**3**		

1-Low, 2-Medium, 3-High

25GE111 DESIGN THINKING FOR INNOVATION
(Common to all B.E./B.Tech./B.Des. Degree Programmes)

0 0 2 1

Foundations of Design Thinking History & Origins: Roots in Creative Problem Solving: Traces back to mid-20th century practices in architecture, engineering, and psychology. Herbert Simon's 'Sciences of the Artificial" (1969): Introduced design as a way of thinking distinct from scientific inquiry. IDEO and the Rise of Human-Centered Design: Popularized design thinking as a repeatable, user-focused innovation process. Stanford school's Influence: Helped institutionalize design thinking in education and entrepreneurship.

Variations of Design Thinking Phases: IDEO's 3-Phase Model: Inspiration, Ideation, Implementation A flexible, non-linear approach emphasizing creativity and action. Stanford school's 5-Phase Model: Empathize, Define, Ideate, Prototype, Test A structured yet iterative framework centered on user empathy. Double Diamond Model (Design Council UK): Divides the process into Discover, Define, Develop, and Deliver—highlighting divergent and convergent thinking.

Related Concepts & Frameworks: Human-Centered Design (HCD): Focuses on designing solutions that deeply resonate with users' needs and contexts. Systems Thinking: Encourages understanding the broader ecosystem and interdependencies within a problem space. Agile & Lean UX: Integrates design thinking with iterative development and minimal viable experimentation. Service Design: Applies design thinking to orchestrate holistic user experiences across touch points. Participatory Design: Involves stakeholders directly in the design process to ensure relevance and inclusivity.

EMPATHIZE: Apply Human-Centric Design Principles: Focus on designing solutions that prioritize user needs, experiences, and values throughout the process. Consult Experts: Engage with subject matter experts to gain foundational knowledge about the problem space. Competitive Analysis: Identify & study similar products or services to identify gaps and opportunities. Stakeholder Interviews: Engaging with people who influence or are affected by the product or service. Conduct Observations: Observe users in their natural environment to understand behaviors, challenges, and interactions. Engage with Users: Use interviews, conversations, and other methods to connect with users and hear their stories. Immerse Yourself: Step into the users' context to experience their environment and challenges first hand. Create Empathy Maps: Visualize what users say, think, feel, and do to synthesize insights. Identify User Needs and Pain Points: Extract meaningful patterns and needs from user interactions and observations. Set Aside Assumptions: Approach the research with an open mind, suspending personal biases and preconceptions. Document Insights: Capture quotes, observations, and emotional cues to inform the next stage (Define). **(6)**

DEFINE: Organize Research Findings: Review and structure the data collected during the Empathize stage. Analyze Observations: Identify patterns, themes, and insights from user interactions and behaviors. Craft a Human-Centered Problem Statement: Frame the problem from the user's perspective, focusing on their needs—not business goals. Avoid Business-Centric Framing: Refrain from defining problems based on company objectives alone (e.g., market share). Persona Development: Synthesizing research into user personas to guide design decisions. Use Empathy to Guide Definition: Ensure the problem statement reflects real user challenges and motivations. Develop Point-of-View Statements: Create concise summaries that capture who the user is, what they need, and why. Prepare for Ideation: Formulate "How Might We" questions to spark creative thinking in the next phase. **(6)**

IDEATE: Review the Problem Statement: Revisit the user-centric problem defined in the previous stage to guide ideation. Explore Multiple Perspectives: Encourage diverse viewpoints to broaden the range of potential solutions. Use Ideation Techniques: Apply methods like Brainstorming, Brain writing, SCAMPER, and Worst Possible Idea to spark creativity. Encourage Free Thinking: Create a judgment-free space to generate as many ideas as possible without filtering. Expand the Problem Space Push boundaries and explore unconventional or extreme ideas to uncover hidden opportunities. Refine and Select Ideas: Use evaluation techniques to identify promising concepts that address user needs effectively. Prepare for Prototyping: Choose ideas that are feasible and impactful to develop into tangible prototypes in the next stage. **(6)**

PROTOTYPE: Build Low-Cost Prototypes: Create simple, scaled-down versions of the product or its features to explore ideas. Experiment with Solutions: Implement different solutions from the Ideate stage into prototypes for testing. Test Internally and Externally: Share prototypes with team members, other departments, or a small group of users. Observe User Interactions: Watch how users engage with the prototypes to uncover usability issues and insights. Evaluate and Iterate: Accept, refine, or discard prototypes based on user feedback and performance. Identify Limitations: Discover constraints and challenges in the proposed solutions through hands-on testing. Gain Deeper User Understanding: Learn how users think, feel, and behave when interacting with the product. **(6)**

TEST: Conduct Rigorous Testing: Evaluate the complete product using the most promising prototypes. Observe Real User Interactions: Study how users behave, think, and feel while using the product. Gather Feedback and Insights: Collect qualitative and quantitative data to assess usability and effectiveness. Identify Remaining Issues: Detect limitations, pain points, and areas for improvement. Refine and Iterate: Use test results to improve the product and revisit earlier stages if needed. Redefine Problems if Necessary: Reframe or adjust problem statements based on new insights. Enhance Understanding of Users: Deepen empathy and knowledge of user needs through real-world testing.

(6)

Design Thinking & Customer Centricity: A human-centered approach that blends empathy and innovation to create solutions that truly resonate with customer needs. Practical Examples of Customer Challenges: Real-world scenarios where customers face friction, unmet needs, or emotional disconnects in their product or service journey. Use of Design Thinking to Enhance Customer Experience: Applying iterative problem-solving and user insights to craft experiences that are intuitive, delightful, and deeply relevant. Parameters of Product Experience: Key dimensions like usability, accessibility, emotional impact, and consistency that shape how customers perceive and interact with a product. Alignment of Customer Expectations with Product Design: Ensuring that every design decision reflects what customers value, expect, and aspire to achieve through the product.

Total P: 30 Periods

TEXT BOOKS:

1. T. Brown, '*Change by Design*'. Harper Business, 2009.
2. J. Liedtka and T. Ogilvie, '*Designing for Growth*'. Columbia Business School Publishing, 2011.

REFERENCES:

1. 1.T. Kelley and D. Kelley, '*Creative Confidence*'. Crown Business, 2013.
2. Stanford d. School resources: https://dschool.stanford.edu/
3. https://apphaus.sap.com/toolkit/methods#design-thinking

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply empathy-driven research to understand user needs.	**K3**
CO2	Frame actionable problem statements and generate creative ideas.	**K5**
CO3	Develop and test prototypes to refine innovative solutions to real-world problems.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3					3	3	3	3		3		
CO2		2				2	2	2	2		2		
CO3			1			1	1	1	1		1		
	3	**2**	**1**			**3**	**3**	**3**	**3**		**3**		

1-Low, 2-Medium, 3-High

25PH111 PHYSICS LABORATORY

0 0 4 2

PHYSICS (ANY TWELVE EXPERIMENTS)

1. Measurement of Hall coefficient of a semiconductor using Hall Effect set-up.
2. Evaluate the Young's modulus of the given material by Uniform Bending method.
3. Investigate the electrical resistivity of a given material using four probe set-up.
4. Estimate the wavelength of laser light using diffraction grating.
5. Determine the thickness of a thin wire using the Air wedge method.
6. Evaluate the Young's modulus of a material using simple harmonic oscillations method.
7. Determination of velocity of sound and compressibility of liquid - Ultrasonic Interferometer.
8. Calculation of Rigidity modulus of a wire and moment of inertia of irregular objects - Torsional Pendulum
9. Validation of Faraday's Law of induction.
10. Demonstration of Newton's Laws of motion.
11. Interpreting the working mechanism of spirometer, CO_2 sensor, Venturi tube and heart rate sensor.
12. Verification of Hooke's Law and calculating spring potential energy
13. Quantify the Numerical Aperture and Acceptance angle of an Optical Fiber using LASER.
14. Obtain the particle size of a micro-particle film using LASER.
15. Ascertain the Planck's constant and work function of a metal - Photoelectric Effect.

DEMONSTRATION

1. Study of I-V characteristics of a solar cell and determination of its efficiency.
2. Determination of bandgap of a semiconductor – Post office box.
3. Determination of force in members of Truss Bridge

Total P: 60 Periods

REFERENCES:

1. Department of Physics, '*Physics Laboratory Observation*'. 2026.
2. Jerry D Wilson; Cecilia A Hernandez Hall, '*Physics Laboratory Experiments*'. Boston, MA: Cengage Learning, 2016

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Relate the scientific principles, compare the experimental results with theoretical calculations, and apply graphical analysis to visualise the importance of precise measurements.	**K3**
CO2	Analyse the experimental result outcomes using analytical and experimental skills for various engineering materials and applications.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3												
CO2		2											
	3	**2**											

1-Low, 2-Medium, 3-High

25RA111 C PROGRAMMING LABORATORY

0 0 2 1

List of Experiments:

1. Formatted I/O statements.
2. Decision Making statements: Simple If, If – else, Switch- case.
3. Looping Statements: For, While, Do – while.
4. Pass by value and pass by address, Recursion using functions.
5. Single dimensional arrays and multi-dimensional arrays.
6. Operations on Strings.
7. Structures and enumerations.

Total P: 30 Periods

REFERENCES:

1. Reema Thareja, '*Introduction to C Programming'*. Third Edition, Oxford University Press, 2023.
2. Byron S. Gottfried and Jitendar Kumar Chhabra, '*Programming with C*'. Tata McGraw Hill Publishing Company, New Delhi, 2018.
3. Herbert Schildt, '*C-The Complete Reference*'. Tata McGraw Hill Publishing Company, New Delhi, 2010.
4. Pradip Dey and Manas Ghosh, '*Programming in C*'. Oxford University Press, New Delhi, 2018.
5. Yashavant P. Kanetkar, '*Let Us C'*. BPB Publications, 2017.
6. H. M. Deitel and P. J. Deitel '*C How to Program*'. Pearson Education, New Delhi, 2013

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understand the functionality and implementation of C programming through pseudo code.	**K2**
CO2	Develop and execute C programs computational problems.	**K3**
CO3	Analyse and debug complex C programs and modify programs to optimize performance and functionality.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3				3								
CO3		2			2								
	3	**2**			**3**								

1-Low, 2-Medium, 3-High

25EE111 FOUNDATIONS OF ELECTRICAL AND ELECTRONICS LABORATORY

0 0 4 2

LIST OF EXPERIMENTS:

1. Soldering and Desoldering of Electronic Components
2. Verification of Ohm's Law and Kirchhoff's Laws
3. House Wiring
4. Measurement of Single-Phase and Three-Phase Power
5. Three-Phase Transformer Connections and Measurement of Phase and Line Voltages.
6. PN Junction Diode and BJT Characteristics
7. Half-Wave and Full-Wave Rectifier Circuits
8. Series Voltage Regulator
9. Transistor–Relay based Control Circuit
10. Load Test on DC Shunt Motor
11. Stepper Motor Characteristics
12. DC Servo Motor Characteristics

Total: 60 Periods

REFERENCE:

1. EEE Department, '*Electrical and Electronics Engineering Laboratory Manual*'. EEE Department, 2026

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain fundamental electrical, electronic and digital concepts.	**K2**
CO2	Apply measurement, soldering and circuit assembly techniques to realize basic electrical and electronic circuits	**K3**
CO3	Interpret experimental results and circuit responses to relate practical observations with fundamental electrical and electronic principles.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3												
CO3		3			2								
	3	**3**			**2**								

1-Low, 2-Medium, 3-High

25GEM01 INDUCTION PROGRAMME
(Common to All B.E./B.Tech./B.Des. Degree Programmes)

All students shall undergo an induction programme at the beginning of the first semester for duration of three weeks as per the guidelines of All India Council for Technical Education (AICTE). A student completing the induction programme will be awarded a completed grade in the grade sheet, and only the students who complete the induction programme shall be considered as eligible for award of degree subject to satisfying other conditions. A student who does not complete the induction programme in the first semester shall redo the same in the subsequent semester.

SEMESTER II
25MA201 COMPLEX VARIABLES AND TRANSFORMS
(Common to All B.E./B.Tech. Degree Programmes)

3 1 0 4

COMPLEX DIFFERENTIATION: Derivative, analytic function, Cauchy-Riemann equations, Laplace's equation, linear fractional transformations. **(9+3)**

COMPLEX INTEGRATION: Cauchy's integral theorem, Cauchy's integral formula, derivatives of analytic functions, Laurent series, singularities and zeros, residue integration method (Residue integration of complex integrals only). **(9+3)**

LAPLACE TRANSFORMS: Laplace transform, linearity, first shifting theorem, transforms of derivatives and integrals, unit step function, second shifting theorem, Dirac's delta function, periodic functions, differentiation and integration of transforms, solving ODEs with constant coefficients and initial value problems. **(9+3)**

FOURIER ANALYSIS: Fourier series – arbitrary period, even and odd functions, half-range expansions. Fourier transforms, Fourier cosine and sine transforms. **(9+3)**

PARTIAL DIFFERENTIAL EQUATIONS: Basic concepts of PDEs, wave equation, heat equation, steady state two-dimensional heat problems, solution by Fourier series. **(9+3)**

Total L: 45 + T: 15 = 60 Periods

TEXT BOOKS:

1. Erwin Kreyszig, '*Advanced Engineering Mathematics*'. Wiley India, New Delhi, 2018.
2. G.Z. Dennis, '*Advanced Engineering Mathematics*'. Jones and Bartlett Pvt Ltd, New Delhi, 2017.

REFERENCES:

1. G.Z. Dennis and D.S. Patrick, '*A first course in Complex Analysis with Applications*'. Jones and Bartlett Pvt Ltd, New Delhi, 2015.
2. C.R. Wylie and L.C. Barret, '*Advanced Engineering Mathematics*'. Tata McGraw-Hill, New Delhi, 2019.
3. Peter V.O Neil, '*Advanced Engineering Mathematics*'. Cengage, New Delhi, 2018.
4. G.D. Dean, '*Advanced Engineering Mathematics with MATLAB*'. CRC Press, USA, 2017.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts related to Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations.	**K2**
CO2	Apply the techniques of Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Complex Variables, Laplace Transforms, Fourier Analysis and Partial Differential Equations.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	1
CO3		1										3	1
CO4					1						1	3	1
	3	**1**			**1**						**1**	**3**	**1**

1-Low, 2-Medium, 3-High

25RA201 FOUNDATIONS OF ROBOTICS AND AI

3 0 0 3

INTRODUCTION TO ROBOTICS: Definition and scope of robotics; Key terminology – robot, manipulator, degrees of freedom, workspace, payload; Origin of the word 'robot' and historical milestones; First industrial robot: Unimate and early development; Evolution of industrial robotics through decades; Types of robots — industrial, service, humanoid, mobile, space, and autonomous vehicles; Human–robot collaboration; Present trends and future directions in robotics. **(9)**

ROBOT SYSTEM COMPONENTS AND APPLICATIONS: Overview of a robotic system and mechanical structure; Actuator systems — electric and pneumatic actuators, drive systems, and gear mechanisms; End effectors and grippers — types and selection criteria; Sensors in robotics — position, force, proximity, vision, and motion feedback; Classification of robots — articulated arm, SCARA, gantry, and delta robots; Kinematic structure of robot types; Industrial applications — surface machining, joining, separating technologies; Role of robots in the automation pyramid. **(10)**

ROBOT COORDINATE SYSTEMS AND PROGRAMMING: Introduction to robot controller architecture; Control panels and handheld programming devices; Robot coordinate systems — world, joint, tool, and base frames; Introduction to geometrical kinematics — forward kinematics basics; Teach-in and playback programming methods; Basic robot programming concepts; Introduction to offline programming; Simple path and trajectory planning concepts. **(8)**

INTRODUCTION TO ARTIFICIAL INTELLIGENCE: Definition and scope of AI; Historical development – Turing test, birth of AI: Dartmouth, early rule-based systems, AI winters, and the deep learning revolution; Types of AI — narrow AI, general AI, and super intelligence; Machine learning basics — supervised, unsupervised, and reinforcement learning; Introduction to neural networks and deep learning; Natural language processing and computer vision overview; Current state of AI — large language models and generative AI; Ethical considerations and future directions — AGI, AI governance, and responsible AI. **(9)**

AI IN ROBOTICS — CONVERGENCE AND FUTURE DIRECTIONS: Role of AI in modern robotics; Machine learning for robot perception and decision-making; Computer vision in robotics; AI-driven path planning and motion generation; Natural language interaction in human–robot systems; AI in collaborative robots (cobots); AI applications in industrial automation and service robotics; Future trends — cognitive robotics, swarm intelligence, and AI-powered humanoids. **(9)**

Total L: 45 Periods

TEXT BOOKS:

1. Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani and Giuseppe Oriolo, '*Robotics: Modelling, Planning and Control*'. Springer, 1st Edition, 2009.
2. Stuart Russell and Peter Norvig, '*Artificial Intelligence: A Modern Approach*', Pearson, 4th Edition, 2020.

REFERENCES:

1. John J. Craig, '*Introduction to Robotics: Mechanics and Control*'. Pearson, 3rd Edition, 2004.
2. Mikell P. Groover, '*Industrial Robotics: Technology, Programming, and Applications*'. McGraw-Hill, 1st Edition, 1986.
3. Ethem Alpaydin, '*Introduction to Machine Learning*'. MIT Press, 4th Edition, 2020.
4. Ian Goodfellow, Yoshua Bengio and Aaron Courville, '*Deep Learning*'. MIT Press, 1st Edition, 2016.
5. Roland Siegwart, Illah R. Nourbakhsh and Davide Scaramuzza, '*Introduction to Autonomous Mobile Robots*'. MIT Press, 2nd Edition, 2011.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the working principles, structural components, and classification of robotic systems and foundational AI ideas	**K2**
CO2	Apply relevant techniques, tools, and programming methods to address basic problems in robotics and AI-based systems	**K3**
CO3	Evaluate the suitability and impact of robotic and AI solutions for real-world engineering challenges	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	3											3	3
CO3		3		2				2	2			3	3
	3	**3**		**2**				**2**	**2**			**3**	**3**

1-Low, 2-Medium, 3-High

25RA202 FUNDAMENTALS OF ENGINEERING MECHANICS

3 1 0 4

STATICS OF PARTICLES: Newton's Laws of Motion, force as a vector (Cartesian and Polar coordinates form), resolution and resultant of forces, free body diagrams, equilibrium of a particle in two and three dimensions, moment of force about a point, force-couple systems. **(10+3)**

STATICS OF RIGID BODIES: Equivalent systems of forces (2D and 3D space), Transmissibility, moment of a force, Varignon's theorem, moment of a couple; Equilibrium of a rigid body in 2D and 3D space - reactions at supports and connections; Analysis of structures: Simple trusses - method of joints, method of sections, joints under special loading conditions, analysis of frames and machines. **(10+3)**

KINETICS OF PARTICLES AND RIGID BODIES - NEWTON'S SECOND LAW AND FRICTION: Rectilinear and rotary motion: Newton's second law, D'Alembert's principle, dependent motion of several particles; Friction: concepts of friction, problems involving dry friction; Wedges, square-threaded screws, journal bearings - axle friction, thrust bearings - disk friction, wheel friction - rolling resistance, belt friction. **(9+3)**

KINETICS OF PARTICLES AND RIGID BODIES – ENERGY METHODS: Work-energy and power: Work of a force, Conservative and non-conservative forces, kinetic energy, principle of work and energy, potential energy, conservation of energy, power and efficiency; Solving problems using the concepts of friction wherever applicable. **(8+3)**

CENTROIDS, CENTRES OF GRAVITY AND MOMENTS OF INERTIA: Centroids of areas, lines, composite areas, moment of inertia of plane figures, polar moment of inertia, radius of gyration, Mass Moments of inertia of thin plates, and composite bodies. **(8+3)**

Total L: 45 + T: 15 = 60 Periods

TEXT BOOKS:

1. Ferdinand P. Beer, E. Russell Johnston, David F. Mazurek, Philip J. Cornwell, Sanjeev Sanghi and Brian P. Self, '*Vector Mechanics for Engineers Statics and Dynamics*'. McGraw Hill Education (India) Private Ltd., New Delhi, 12th edition, 2019.
2. A. Nelson, '*Engineering Mechanics -Statics and Dynamics*'. Tata McGraw Hill Education (India) Private Ltd., New Delhi,1st edition, 2017.

REFERENCES:

1. S. Rajasekaran and G. Sankarasubramanian, '*Engineering Mechanics-Statics and Dynamics*'. Vikas Publishing House Pvt. Ltd., New Delhi, 2006.
2. James L. Meriam, L. Glenn Kraige and J.N. Bolton, '*Engineering Mechanics – Statics*'. Wiley India Private Limited, 2017.
3. James L. Meriam, L. Glenn Kraige and J.N. Bolton, '*Engineering Mechanics – Dynamics*'. Wiley India Private Limited, 2018.
4. S.S. Rattan, '*Theory of Machines*'. Tata McGraw Hill Publishers, New Delhi, 4th edition, 2017.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain fundamental engineering mechanics concepts like force systems, equilibrium, friction, centroid, moment of inertia, and dynamics.	**K2**
CO2	Apply principles of equilibrium, friction, centroid, inertia, and motion to solve real-world engineering problems.	**K3**
CO3	Analyse static and dynamic systems including trusses, frames, rotating bodies, and mechanical systems using laws of mechanics.	**K4**
CO4	Design mechanical systems for stability and efficiency of robot using appropriate tools.	**K5**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	1
CO3		2										3	1
CO4		1		1							1	3	1
	3	**2**		**1**							**1**	**3**	**1**

1-Low, 2-Medium, 3-High

25RA203 SENSORS TRANSDUCERS AND SIGNAL CONDITIONING

3 0 0 3

MEASUREMENTS AND MEASURING SYSTEMS: Methods of Measurement, Classification and Functions of Instruments, Elements of a Generalized Measurement System. Measurement Standards. Static Characteristics – Accuracy, Precision, Sensitivity, Resolution, Linearity and Repeatability. Dynamic Characteristics – Speed of Response, Fidelity, Lag, First-Order and Second-Order System Response. Position and Motion Measurement in Robotic Systems. Feedback Sensing in Closed-Loop Control Systems. **(9)**

SENSORS AND ENCODERS: Definition, Classification, Principles and Applications of Sensors. Temperature, Displacement, Position, Torque Sensors, Accelerometers, Gyroscopes. Tactile, Infrared, Ultrasonic and Vision Sensors - Principles of Operation and Applications. Sensor Selection Criteria. Encoder Fundamentals: Incremental and Absolute Encoders. Applications in Robotic Manipulators and Servo Systems. **(9)**

TRANSDUCERS FOR ROBOTIC SYSTEMS: Definition, Classification, Characteristics and Applications of Transducers. Potentiometer, Strain Gauge, Inductive Transducers, LVDT, Capacitive, Piezoelectric and Hall Effect Transducers. Photodiode and Phototransistor. Digital Transducers, MEMS Sensors and Smart Sensors. **(9)**

SIGNAL CONDITIONING: Need for Signal Conditioning, Signal Conditioning Blocks. DC Bridges. Offset and Drift Compensation. Operational Amplifier LM741, Inverting and Non-Inverting Amplifiers. First-Order and Second-Order Active Filters. Analog-to-Digital Conversion: Principle, Resolution and Conversion Errors. Digital-to-Analog Conversion - Weighted Resistor and R-2R Ladder Networks. **(9)**

SENSOR CALIBRATION AND ROBOTIC APPLICATIONS: Calibration Concepts and Calibration Curves. Dynamic Response and Time Constant of Sensors. Calibration of Accelerometers, Gyroscopes and Encoders. Resolution, Accuracy and Quantization Error. Sensor Noise, Signal-to-Noise Ratio and Noise Filtering Techniques - Kalman Filtering for IMU Measurements. Applications in Robotic Manipulators, Mobile Robots and Industrial Automation Systems. **(9)**

Total L: 45 Periods

TEXT BOOK

1. Doebelin, E. O. and Manic, D. N, '*Measurement Systems: Applications and Design'.* 7th Edition, McGraw Hill, 2019
2. Richard G. Lyons, '*Understanding Digital Signal Processing*'. 3rd Edition, Pearson, 2011.
3. D. Roy Choudhury, Shail B. Jain, '*Linear Integrated Circuits'.* 5th Edition, New Age, 2018.

REFERENCE

1. K. Sawhney, '*A Course in Electronic Measurements and Instrumentation*'. Dhanpat Rai & Co. (P) Limited, 2015
2. Murthy, D. V. S., '*Transducers and Instrumentation*'. 2nd Edition, Prentice Hall of India, 2011
3. Nakra, B. C. and Chaudhry, K.K., '*Instrumentation, Measurement and Analysis*'. 4th Edition, Tata McGraw Hill, 2016.
4. Curtis D Johnson (2015), '*Process Control Instrumentation Technology*'. 8th Edition, Pearson Education India, 2015.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the working principle of various sensors/transducers, measurement techniques, signal conditioning circuits, and calibration techniques for robotic applications.	**K2**
CO2	Apply statistical and analytical methods for measurement error analysis of sensor/transducers, and estimation of signal processing circuit parameters.	**K3**
CO3	Analyze sensor dynamics and perform calibration of sensors/transducers	**K4**
CO4	Design and analyze signal conditioning circuits based on operational amplifiers, bridges, converters, and active filters using simulation tools.	**K5**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											2	2
CO3		3										2	2
CO4			3		2				2			2	2
	3	**3**	**3**		**2**				**2**			**2**	**2**

1-Low, 2-Medium, 3-High

25RA204 COMPUTATIONAL PROBLEM SOLVING WITH PYTHON

3 0 0 3

INTRODUCTION TO TERMINAL ENVIRONMENTS AND PYTHON BASICS: Introduction to Command Line Interfaces (CLI) and Linux-based terminal environments: basic file system navigation, directory management, and file system permissions. Execution frameworks: interactive mode versus script mode execution via the terminal. Tokens in Python: variables, keywords, comments, literals, data types, and structural indentation. Arithmetic, logical, and bitwise operators along with execution precedence. Expressions, evaluation mechanisms, input parsing, and standard output printing for system data telemetry. **(10)**

CONTROL FLOW AND SELECTIVE LOGIC: Conditional execution paths and branching design: selective statements including simple if, if-else, nested if structures, and multi-way if-elif ladders for complex decision-making logic. Iterative execution models: while loops, finite for loops, and nested control cycles. Loop control mechanisms: utilizing else blocks in loops, and execution redirection commands including break, continue, and pass statements. Manual logic verification and variable tracking via execution trace tables. **(8)**

MODULAR DESIGN, FUNCTIONS, AND STRING PROCESSING: Modular program design using native and user-defined functions: function definitions, types, parameters, and variable execution arguments (positional, keyword, default values, and arbitrary argument lists). Scope of variables: local versus global execution boundaries. Algorithmic execution using basic recursion and lambda expressions. String processing and manipulation: character streams, formatting operations for diagnostic data logs, comparison operators, slicing, splitting, stripping, and basic structural pattern matching. **(9)**

DATA COLLECTIONS AND FILE MANAGEMENT: Sequential data collections. Lists: initialization, element access, slicing mechanisms, negative indexing, structural list methods, and list comprehensions. Tuples: immutable sequences, creation, indexing, and operations for static configurations. Dictionaries: associative data structures, key-value mappings, value replacement, and operations for structural state mapping. Sets: unordered collections, creation, and operations for element exclusion or geometric coordinates. **(8)**

ENVIRONMENT INTERACTIONS, STORAGE, AND OBJECT-ORIENTED DESIGNS: File handling and persistent storage: file organization using relative and absolute paths, text-based log manipulation, file handling modes, and context managers (with statements). Runtime robustness: exception handling hierarchies using try-except blocks, multi-exception management, and parameters via command-line arguments. External packages: utilization of mathematical, visualization, and time utilities (such as NumPy and Matplotlib). Object-Oriented Design Principles: classes, object instantiation, properties, methods, constructor methods (__init__), the self-parameter, inheritance hierarchies, method overriding, and polymorphic behaviors. **(10)**

Total L: 45 Periods

TEXT BOOKS

1. Eric Matthes, '*Python Crash Course A Hands-On, Project - Based Introduction to Programming*'. 3rd Edition, No Starch Press, 2024.
2. Mark Summerfield, '*Programming in Python 3: A Complete Introduction to the Python Language*'. 2nd Edition, Pearson Education, 2018.

REFERENCES

1. Paul Deitel and Harvey Deitel, '*Python for Programmers*'. 1st Edition, Pearson Education, 2021.
2. John V Guttag, '*Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data*'. 3rd Edition, MIT Press, 2021.
3. Allen B. Downey, '*Think Python: How to Think like a Computer Scientist*'. 2nd Edition. O'Reilly Publishers, 2016.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the foundational syntax, operational environments, control flows, and structural data mechanisms of an interpreted programming language.	**K2**
CO2	Implement modular scripts and structured data collections to solve generic engineering and computational logic problems.	**K3**
CO3	Analyze program execution paths, runtime exceptions, and data outputs to optimize script behavior and verify algorithm validity	**K4**
CO4	Evaluate candidate programming paradigms, environment configurations, and external libraries to justify technical selections under predefined constraints.	**K5**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3				2			2	2		2		
CO3		3			2			2	2		2		
CO4			2		2			2	2		2		
	3	**3**	**2**		**2**			**2**	**2**		**2**		

1-Low, 2-Medium, 3-High

25HS201 தமிழரும் தொழில்நுட்பமும்

1 0 0 1

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: *சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.* **(3)**

வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: *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 இந்தோ-சாரோசெனிக் கட்டிடக் கலை.* **(3)**

உற்பத்தித் தொழில் நுட்பம்: *கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணங்கள் – நாணயங்கள் அச்சடித்தல்- மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.* **(3)**

வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: *அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.* **(3)**

அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்: *அறிவியல் தமிழின் வளர்ச்சி – கணினித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.* **(3)**

Total L: 15 periods

25HS201 TAMILS AND TECHNOLOGY

1 0 0 1

WEAVING AND CERAMIC TECHNOLOGY: Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries. **(3)**

DESIGN AND CONSTRUCTION TECHNOLOGY: 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. **(3)**

MANUFACTURING TECHNOLOGY: 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. **(3)**

AGRICULTURE AND IRRIGATION TECHNOLOGY: 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 - Conch diving - Ancient Knowledge of Ocean - Knowledge Specific Societ. **(3)**

SCIENTIFIC TAMIL & TAMIL COMPUTING: 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. **(3)**

Total L: 15 Periods

TEXT – CUM – REFERENCE BOOKS

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

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Identify the significance of ancient Tamil technologies in weaving, pottery, metallurgy, and architecture, with emphasis on traditional design and construction methods across historical periods.	**K2**
CO2	Use insights from traditional Tamil knowledge systems in agriculture, irrigation, and marine sciences, and connect the development of Tamil language to its applications in digital platforms and computing.	**K3**

COs-POs & PSOs MAPPING

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1						1			1		1		
CO2						1			1		1		
						1			**1**		**1**		

1-Low, 2-Medium, 3-High

25RA211 ROBOT DESIGN AND PROTOTYPING LABORATORY

0 0 4 2

LIST OF EXPERIMENTS:

1. **INTRODUCTION TO MAKERSPACE AND COMPONENT EXPLORATION:**
   Familiarization of facilities, tools, safety practices, and reusable robotic components such as motors, wheels, chassis parts, sensors, controllers, fasteners and power modules available in component trays, fasteners.

2. **CREATIVE MECHANICAL ASSEMBLY:**
   Selection and assembly of mechanical structures using modular components.
   Exercises: Design and build custom robot frames/chassis based on student ideas and applications.

3. **ELECTRICAL AND ELECTRONIC INTEGRATION:**
   Identification and integration of electronic components such as switches, batteries, LEDs, sensors, motor drivers and controllers.
   Exercises: Wiring and testing of basic robotic subsystems.

4. **ARDUINO AND INTELLIGENT CONTROL EXPERIMENTS:**
   Introduction to Arduino programming and interfacing
   Exercises: Development of simple control logic for sensors, motors and actuators for customized robotic applications.

5. **ROBOT DESIGN AND PROTOTYPING:**
   Selection of suitable components from open component trays and development of a functional robot prototype based on student-defined objectives.

6. **MOBILE ROBOT DEVELOPMENT:**
   Design and implementation of mobile robots for tasks such as line following, obstacle avoidance, object movement or maze navigation using self-selected components and configurations.

7. **MECHANISM AND MOTION EXPLORATION:**
   Construction and testing of mechanisms such as four-bar linkage, crank-slider, grippers and wheel-drive systems using modular kits and fabrication materials.

8. **RAPID FABRICATION AND ADDITIVE MANUFACTURING:**
   Design and fabrication of customized robot parts using hand tools and 3D printing; Exercises: Fabrication of brackets, sensor holders, wheels and support structures.

9. **REVERSE ENGINEERING AND PRODUCT DISASSEMBLY:**
   Disassembly and study of electro-mechanical products such as printers, mixers, toys and small appliances to understand mechanisms, actuators, sensors and subsystem integration.

10. **INNOVATION CHALLENGE – BUILDING A ROBOT:**
    Team-based activity involving ideation, design, fabrication, programming and demonstration of a robot/prototype developed for a chosen real-world application using components available in the maker space.

11. **PROTOTYPE DEVELOPMENT AND DEMONSTRATION:**
    Demonstration, testing and presentation of developed robotic systems highlighting creativity, innovation, functionality and teamwork.

Total P: 60 Periods

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Comprehend the basic principles, tools, and techniques involved in various workshop practices	**K2**
CO2	Demonstrate the practical skills by performing basic fabrication, joining and assembly	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1						1			1		1		
CO2						1			1		1		
						1			**1**		**1**		

1-Low, 2-Medium, 3-High

25RA212 ENGINEERING DRAWING WITH CAD

0 0 4 2

Orthographic Projection **(12)**

1. Projection of lines - only first angle projections
2. Projection of planes - inclined to the principal planes

Solids and Perspective Projections **(12)**

1. Projection of solids - inclined to one of the principal planes
2. Perspective projection of simple solids

Development and Sections of Solids **(12)**

1. Section of solids - cutting plane inclined to the one of the principal planes
2. Development - sectioned solids (cutting plane inclined to one of the principal planes)

Pictorial Projections **(12)**

1. Orthographic views from pictorial views
2. Isometric views from orthographic views

Computer Graphics **(12)**

1. Modeling of simple engineering components
2. Extraction of 2D views from 3D models

Total P: 60 Periods

TEXT BOOKS:

1. K. Venugopal and V. Prabhu Raja, '*Engineering Graphics*'. New Age International Publishers, 16th edition, 2021.
2. K.C. John, '*Engineering Graphics for Degree*'. PHI Learning Private Limited, 2009.

REFERENCES:

1. '*Bureau of Indian Standards*'. Engineering Drawing Practices for Schools and Colleges SP 46-2003, BIS, 2003.
2. M.B. Shaw and B.C. Rana, '*Engineering Drawing*'. Pearson Education India, 2009.

COURSE OUTCOMES:

At the end of this course, students will be able to:		**Bloom's Level**
CO1	Apply projection techniques to create basic shapes, solids, and sectioned objects.	**K3**
CO2	Model a simple 2D and 3D object using CAD software.	**K2**
CO3	Use the standards and specifications for engineering drawing.	-

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3											3	1
CO2					1							3	1
CO3											1	3	1
	3				**1**						**1**	**3**	**1**

1-Low, 2-Medium, 3-High

25RA213 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

0 0 2 1

List of Experiments

1. Identification and solving of simple real life or scientific or technical problems, and developing algorithms and flow charts for the same.
2. Python programming using simple statements and expressions
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
8. Implementing programs using written modules and Python Standard Libraries
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
11. Exploring Pygame tools and developing a game activity using Pygame.

Total P: 30 Periods

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 and Development Limited, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, '*Python for Programmers*'. Pearson Education, 1st Edition, 2021.
2. John V Guttag, '*Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data*'. 3rd Edition, MIT Press, 2021.

COURSE OUTCOMES:

At the end of this course, students will be able to:		**Bloom's Level**
CO1	Explain the basic constructs of Python Programming	**K2**
CO2	Apply the different data structures like list, tuple, set or dictionary to solve complex problems.	**K3**
CO3	Implement real-time applications using the modules and packages	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	3											3	2
CO3		2			2						2	3	2
	3	**2**			**2**						**2**	**3**	**2**

1-Low, 2-Medium, 3-High

LANGUAGE ELECTIVES

25HS211 COMMUNICATION SKILLS FOR ENGINEERS
(Common to all B.E./B.Tech. Programmes)

0 0 4 2

COMMUNICATION CONCEPTS: Process of Communication – Inter and Interpersonal Communication – Essentials for effectiveness. **(9)**

ORAL COMMUNICATION: Oral presentations with visual aids and Group discussions. **(16)**

FOCUS ON SOFT SKILLS: Etiquette – Work Place etiquette – Telephone etiquette- Body Language – Critical Reasoning and Conflict Management based on Case Studies – Group Communication- Meetings -Interview Techniques. **(14)**

TECHNICAL WRITING: Technical Writing Principles - Style and Mechanics - Technical Definitions – Physical, Functional and Process Descriptions – Technical Report Writing – Preparing Instructions – Interpretation of Technical Data. **(14)**

BUSINESS CORRESPONDENCE: Writing Emails, Preparing Resumes. **(7)**

Total P: 60 periods

TEXT BOOKS

1. Course materials prepared by the Faculty, Department of English, PSG Institute of Technology and Applied Research, Neelambur, Coimbatore.

REFERENCES

1. Jeff Butterfield, '*Soft Skills for Everyone*'. Cengage Learning, New Delhi, 2020.
2. Sabina Pillai, and Agna Fernandez, '*Soft skills and Employability Skills*'. Cambridge University Press, New Delhi, 2019.
3. Prashant Sharma, '*Soft Skills Personality Development for Life Success*'. BPB Publications, New Delhi, 2021.
4. K. N. Shoba, and D. Praveen Sam, '*Technical English*'. Cambridge University Press, New York, 2020.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Produce clear and concise technical reports, compose professional and effective emails and develop well-structured and impactful resumes	**K2**
CO2	Plan, organize, and deliver engaging and informative presentations using appropriate visual aids and participate positively in group discussions	**K3**
CO3	Resolve disagreements constructively, embody professional conduct and a strong work ethic and apply critical thinking to generate effective solutions	**-**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1										2			
CO2										3			
CO3									3	3			
									3	**3**			

1-low, 2-medium, 3-high

25HS212 BASIC GERMAN
(Common to all B.E./B.Tech. Programmes)

0 0 4 2

Guten Tag! - Learning: To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, speak about countries & languages; **Vocabulary:** related to the topic; **Grammar:** W – Questions, Verbs & Personal pronouns I.

Freunde, Kollegen und ich - Learning: To speak about hobbies, jobs, learn numbers from 20; **Vocabulary:** related to the topic; **Grammar:** Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage, singular/plural.

In der Stadt – Learning: To know places, buildings, question, know transport systems, understand international words; **Vocabulary**: related to the topic; **Grammar:** Definite & indefinite articles, Negotiation, Imperative with Sie.
Guten Appetit! – Learning: To speak about food, shop, converse; **Vocabulary:** related to the topic; **Grammar:** Sentence position, Accusative, Accusative with verbs.

Tag für Tag and Zeit mit Freunden – Learning: To learn time related expressions, speak about family, ask excuse, fix appointments on phone, birthdays, understand & write invitations, converse in the restaurant; **Vocabulary:** related to the topic; **Grammar:** Preposition – am, im, um, von…bis, Possessive articles, Modal verbs.

Total P: 60 periods

TEXT BOOK:

1. Dengler, Stefanie et al., '*Netzwerk A1.1*'. Klett-Langenscheidt Gmbh, München, 2013.

REFERENCES:

1. Dengler, Stefanie et al., '*Netzwerk A1'.* Klett-Langenscheidt Gmbh München, 2013.
2. Sandra Evans, Angela Pude, and Franz Specht, '*Menschen A1*'. Hueber Verlag, 2012.
3. Hermann Funk, Christina Kuhn, and Silke Demme, '*Studio d A1*'. Goyal Publishers & Distributors Pvt. Ltd, 2009.
4. Rosa-Maria Dallapiazza, Eduard von Jan, '*Til Schönherr*'. Tangram Aktuell 1 (Deutsch als Fremdsprache), Max Hueber Verlag, 2004.

25HS213 BASIC JAPANESE
(Common to all B.E./B.Tech. Programmes)

0 0 4 2

Orientation Session, Geographic & Socio, economic perspective to Japan, Japanese people and culture and Basic greetings and responses.

Basic script, Method of writing hiragana and katakana, and Combination sounds and simple words.

Topic marker "wa", Desu / dewa arimasen cupolas, Interrogative particle "ka", Grammar particles "mo", "no", "Introducing someone: "Kochira wa ~" and Self introductions: Hajimemashite"

Demonstratives "Kore", "Sore", "Are", Demonstrative "Kono", "Sono", "Ano", Possessive noun particle "no" and Japanese apartments: Greeting your neighbor.

Place markers "Koko", "Soko", "Asoko", Direction markers "Kochira", "Sochira", "Achira" and Japanese department stores: Asking for and buying something.

Asking for and telling the time, Particle "ni (at)" for time, kara (from) ~ made (until), Particle "to (and)", Time periods: Days of the week, months, time of day, Verbs (Present / future and past tense) and Telephone enquiry: Asking for a phone no. And business hours.

Destination particle "e", Particles "de (mode of transportation)" and "to (with) and Japanese train station: Asking for Fare and track no. / types of trains.

Direct object particle "o", Particle "de (place of action)", Verbs ("~masen ka", "~mashou") and "Ohanami" Cherry blossom viewing.

Particle "de (by means of)", Particle "ni (to)", Aaemasu (give) and Moraimasu (receive) and Visiting a Japanese house.
Adjectives ("i" and "na" type), Adjectives (Positive and negative usage), Particle "ga (however, but), "Dore which?)" and Leaving a room, thanking someone for hospitality.

Likes and dislikes, Potential verbs (wakarimasu and dekimasu), "Kara (~ because)", Adverbs and Asking someone out over the phone.

Verbs denoting presence: "Imasu" and "arimasu", Particle "ni (in)", "Dare (who?)", Adverbs ("Chikaku ni ~ "), Particle "dare mo (negative ~ no one)" , Dare ka (anyone), dare ga (who) , Nani ka (anything) , nani ga (what) - ~ya (and) ~ nado (etc.) and Asking for directions.

Counters and Counting suffixes.

Introduction to Adjectives (na and ii type), Different usages of adjectives, Comparison, Likes and dislikes and Going to a trip.

Need and desire (ga hoshii), Wanting to … (Tabeti desu), Going for a certain purpose (mi –ni ikimasu) and Choosing from a menu.
Verb groups, I, II and III and Exercises to group verbs.

Please do (te kudasai), Present continuous tenses (te imasu), Shall I? (~ mashou ka) and Describing a natural phenomenon (It is raining).
To grant permission (~te mo ii desu), Asking for permission (~ te mo ii desu ka) and Should not do (~ te waikemasen) Describing a continuing state and Describing a habitual action.
Roleplays in Japanese.
A demonstration on usage of chopsticks and Japanese tea party. **Total P: 60 periods**

TEXT BOOK

1. '*Minna no nohongo'.* – Romaji ban (first 10 lessons of this book).

REFERENCE

1. '*Minna no Nihongo I Honsatsu Roma – ji ban (Main Textbook Romanized Version)'.* International publisher – 3A Corporation,Tokyo, Indian distributor – Goyal Publishers & Distributors, New Delhi

MANDATORY COURSES
25MC001 ENVIRONMENTAL SCIENCES
(Common to B.E./B.Tech. Programmes)

3 0 0 3

INTRODUCTION TO ENVIRONMENT: Environment - Definition, scope and importance. Types and composition of atmosphere – particles, ions and radicals. Ozone layer- significance, formation and depletion. Ecosystems- Structure and functions, components, energy flow, food chains, food web, Biodiversity-levels, values and threats – India as a mega-diversity nation, hotspots of biodiversity, endangered and endemic species of India, conservation of biodiversity. **(9)**

ENERGY RESOURCES: Introduction – National and International status- exploitation - sustainable strategies- Fossil fuels-classification, composition, physico-chemical characteristics and energy content of coal, petroleum and natural gas; solar energy - introduction, harnessing strategies. Wind energy - availability, wind power plants, wind energy conversion systems, site characteristics, and types of wind turbines. Supporting renewable energy resources -tidal, geothermal, hydroelectric. **(9)**

ENVIRONMENTAL POLLUTION: Definition, Sources, causes, impacts and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards, RF hazards, Role of an individual in prevention of pollution. Disaster Management: Floods, earthquake, cyclone and landslides – Case studies, consequences and rescue measures. **(9)**

WASTE MANAGEMENT: Waste water - Characteristics of domestic and industrial wastewater - COD and BOD, Various stages of treatment – primary, secondary, tertiary treatment- Biological and advanced oxidation processes. Solid waste management – Characteristics of municipal solid waste (MSW), biomedical, automobile and e-wastes and their management, landfills, incineration, pyrolysis, gasification and composting**.** **(9)**

SOCIAL ISSUES AND THE ENVIRONMENT: Environmentally Sustainable work practices- Rain water harvesting, Role of non-governmental organizations. Human ethics and rights- impact on environment and human health, role of information technology on environment and human kind. Green IT policies, Process of EIA - ISO 14000. Legislation- Environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act. **(9)**

Total L: 45 periods

TEXT BOOKS:

1. Gilbert M. Masters, '*Introduction to Environmental Engineering and Science*'. Pearson Education, New Delhi, 2004.
2. Deswal S and Deswal A, '*A Basic Course in Environmental Studies*'. Dhanpat Rai and Co, New Delhi, 2004.

REFERENCES:

1. Benny Joseph, '*Environmental Science and Engineering*'. Tata McGraw - Hill, New Delhi, 2006.
2. Koteswara Rao M V R, '*Energy Resources: Conventional & Non – Conventional*'. BSP Publications, New Delhi, 2006.
3. Botkin and Keller, '*Environmental Science*'. Wiley India Private Limited, New Delhi, 2013.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the basic concepts of environment, energy sources and waste management	**K2**
CO2	Use different renewable energy resources and environment protection measures for sustainable development	**K3**
CO3	Conduct a case study on real-time environmental issues and present findings as a team	**-**

COs-POs & PSOs MAPPING:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	1												
CO3						2	2	2			2		
	1					**2**	**2**	**2**			**2**		

1-low, 2-medium, 3-high

25MC002 INDIAN CONSTITUTION
(Common to B.E./B.Tech. Programmes)

2 0 0 0

INTRODUCTION: Evolution of Indian Constitution; significance of constitution; Composition; Preamble and its Philosophy. **(4)**

RIGHTS, DUTIES AND DIRECTIVE PRINCIPLES: Fundamental Rights- Writs and Duties, Directive Principles of State Policy. **(5)**

UNION GOVERNMENT: Union Government, President and Vice President, Houses of the Parliament and their functions; Types of Bills, Stages of passing of Bill into an Act, Veto Power, Constitution Amendment Procedure, Various Amendments made and their significance for India. **(6)**

STATE GOVERNMENT AND FEDERALISM: Composition of State Legislature; Powers, Functions and Position of Governor, Function of Chief Ministers, Council of Ministers; The Indian Federal System, Administrative Relationship between Union and States. **(8)**

JUDICIARY: Supreme Court, High Court; District Court and Lower Courts - Functions and Powers – Judges – Qualifications and Powers - Judicial Review. **(7)**

Total L: 30 periods

TEXT BOOKS:

1. Subash C Kashyap, '*Our Political System*'. National Book Trust, 2011.
2. Praveenkumar Mellalli E, '*Constitution of India, Professional Ethics and Human Rights*'. Sage Publications India Pvt. Ltd., 2015.

REFERENCES:

1. Briji Kishore Sharma, '*Introduction to the Constitution of India*'. Prentice Hall of India, 2010.
2. Basu D D, '*Introduction to the Constitution of India*'. Prentice Hall of India, 2016.
3. Jain. M C, '*The Constitution of India*'. Law House, New Delhi, 2001.
4. Shukla V N, '*Constitution of India*'. Eastern Book Company Ltd., New Delhi, 2011.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the evolution, significance, and philosophy of the Indian Constitution, including its Preamble, composition, and core principles.	**K2**
CO2	Analyze the structure, powers, and functions of the Union and State Governments, including the roles of the President, Parliament, Governor, and Council of Ministers, as well as the legislative process, types of bills, and constitutional amendments.	**K4**
CO3	Conduct a case study on the Indian Constitution, demonstrating understanding of its evolution, fundamental rights and duties, structure of Union and State governments, federal system, and the role of the judiciary in governance.	**-**

COs-POs & PSOs MAPPING:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	2												
CO3								2	2		2		
	2							**2**	**2**		**2**		

1-low, 2-medium, 3-high

25MC003 INDUSTRIAL SAFETY
(Common to B.E./B.Tech. Programmes)

2 0 0 0

SAFETY TERMINOLOGIES: Hazard-Types of Hazard- Risk-Hierarchy of Hazards Control Measures-Lead indicators- lag Indicators-Flammability- Toxicity Time-weighted Average (TWA) - Threshold Limit Value (TLV) -Short Term Exposure Limit (STEL)- Immediately dangerous to life or health (IDLH)- acute and chronic Effects-Routes of Chemical Entry-Personnel Protective Equipment- Health and Safety Policy-Material Safety Data Sheet MSDS. **(6)**

STANDARDS AND REGULATIONS: Indian Factories Act-1948- Health- Safety- Hazardous materials and Welfare- ISO 45001:2018 occupational health and safety (OH&S) - Occupational Safety and Health Audit IS14489:1998- Hazard Identification and Risk Analysis- code of practice IS 15656:2006. **(6)**

SAFETY ACTIVITIES: Toolbox Talk- Role of safety Committee- Responsibilities of Safety Officers and Safety Representatives- Safety Training and Safety Incentives- Mock Drills- On-site Emergency Action Plan- Off-site Emergency Action Plan- Safety poster and Display- Human Error Assessment. **(6)**

WORKPLACE HEALTH AND SAFETY: Noise hazard- Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA- Unsafe act & Unsafe Condition- Electrical Hazards- Crane Safety- Toxic gas Release. **(6)**

HAZARD IDENTIFICATION TECHNIQUES: Job Safety Analysis-Preliminary Hazard Analysis-Failure mode and Effects Analysis- Hazard and Operability- Fault Tree Analysis- Event Tree Analysis Qualitative and Quantitative Risk Assessment- Checklist Analysis- Root cause analysis- What-If Analysis- and Hazard Identification and Risk Assessment. **(6)**

Total L: 30 periods

TEXTBOOKS

1. Jain R. K. and Sunil S. Rao, '*Industrial Safety, Health and Environment Management Systems*'. Khanna Publisher, 4th Edition, 2000.
2. Deshmukh L. M., *'Industrial Safety Management: Hazard Identification and Risk Control'*. McGraw-Hill Education, 2007.

REFERENCES

1. John Ridley, John Channing, '*Safety at Work*'. Routledge, 7th Edition, 2008.
2. Dan Petersen, '*Techniques of Safety Management*: *A System Approach*'. Amer Society of Safety Engineers, 4th Edition, 2003.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Describe the safety protocols and standard operating procedures in industrial settings to ensure compliance with safety regulations and minimize hazards in the workplace.	**K2**
CO2	Implement and test emergency response plans tailored to the industrial environments, ensuring effective action during emergencies such as fires, chemical spills or equipment malfunctions.	**K3**
CO3	Review and present on risk assessments and hazards using industry-specific tools to identify potential safety risks and choose appropriate corrective actions to prevent accidents and injuries.	-

CO - PO & PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1													
CO2	2					2	2						
CO3						1	1	1	1		1		1
	2					**2**	**2**	**1**	**1**		**1**		**1**

1 - low, 2- medium, 3 – high

25MC004 DISASTER RISK REDUCTION AND MANAGEMENT
(Common to B.E./B.Tech. Programmes)

2 0 0 0

HAZARDS, VULNERABILITY AND DISASTER RISKS: Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced – Earthquake, Landslide, Flood, Drought, Fire, etc. – Technological disasters - Structural collapse, Industrial accidents, oil spills - Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies, Inter relations between Disasters and Sustainable development Goals. **(6)**

DISASTER RISK REDUCTION (DRR): Sendai Framework for Disaster Risk Reduction, Disaster cycle - Community Based DRR, Structural – Non-structural measures, Roles and responsibilities of - community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders - Early Warning System – Relevance of indigenous Knowledge, appropriate technology and Local resources. **(6)**

DISASTER MANAGEMENT: Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction - Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Institutional Processes and Framework at State and Central Level - (NDMA – SDMA – DDMA – NRDF - Civic Volunteers). **(6)**

TOOLS AND TECHNOLOGY FOR DISASTER MANAGEMENT: Early warning systems - Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness) – Role of GIS and Information Technology in Disaster Management – Disaster Damage Assessment - Elements of Climate Resilient Development – Standard operation Procedure for disaster response – Financial planning for disaster Management. **(6)**

DISASTER MANAGEMENT: CASE STUDIES: Case studies in the context of disasters - Landslide Hazard Zonation, Earthquake Vulnerability Assessment of Buildings and Infrastructure, Drought Assessment, Coastal Flooding, Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding, Forest Fire, Man Made disasters. **(6)**

Total L: 30 periods

TEXTBOOKS

1. Thomas D. Schneid, and Larry Collins, '*Disaster Management and Preparedness*'. CRC Publications, 2016.
2. R. Singh, '*Disaster Management Guidelines: Earthquakes, Landslides, Avalanches and Tsunami'*. Horizon Press Publications, 2017.
3. J. P. Singhal, '*Disaster Management'*. Laxmi Publications, 2024.
4. T. Bhattacharya, '*Disaster Science and Management'*. McGraw Hill India Education Pvt. Ltd., 2012.

REFERENCES

1. Government of India, '*Disaster Management Act'*. New Delhi, 2005.
2. Government of India, '*National Disaster Management Policy'*. New Delhi, 2009.
3. R. Shaw, '*Community based Disaster risk reduction*'. Natural Hazard Science, Oxford Research Encyclopedias, 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts, tools, technologies and strategies for disaster risk reduction and management.	**K2**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1					1	1	1	1	1		1		
					1	**1**	**1**	**1**	**1**		**1**		

1-low, 2-medium, 3-high

25MC005 INDIAN KNOWLEDGE SYSTEMS FOR SUSTAINABLE HUMAN DEVELOPMENT

2 0 0 0

INTRODUCTION TO INDIAN KNOWLEDGE SYSTEMS & HUMAN DEVELOPMENT (6)

- Meaning, scope, and significance of Indian Knowledge Systems
- Indian view of life: Purusharthas (Dharma, Artha, Kama, Moksha)
- Relationship between individual, society, and nature
- Relevance of IKS in modern education and engineering

INDIAN PERSPECTIVES ON SUSTAINABILITY & ECOLOGY (6)

- Indian worldview on nature: Pancha Mahabhutas
- Traditional water management, agriculture, and resource conservation
- Sustainable lifestyles in Indian traditions
- Comparison with modern sustainable development goals (SDGs

HEALTH, WELL-BEING & HUMAN POTENTIAL IN IKS (6)

- Indian concept of health: Body–Mind–Spirit integration
- Introduction to Ayurveda & Yoga for sustainable health
- Mental health and emotional balance in Indian wisdom
- Food, nutrition, and lifestyle from IKS perspective
- Preventive healthcare through traditional knowledge

ETHICS, VALUES & SOCIAL SUSTAINABILITY (5)

- Work ethics and leadership in Indian tradition
- Gender dignity and social justice in Indian thought
- Professional ethics through IKS

IKS, TECHNOLOGY & SUSTAINABLE DEVELOPMENT (7)

- Science and technology in ancient India
- Sustainable engineering in traditional architecture and town planning
- Metallurgy, textiles, and indigenous manufacturing systems
- IKS and modern innovation ecosystems and ethical responsibility
- Role of engineers in sustainable human development **Total L: 30 periods**

TEXTBOOKS

1. Dharampal, '*Indian Science and Technology in the Eighteenth Century'*.
2. Kapil Kapoor, *'Indian Knowledge Systems'*.
3. S Radhakrishnan, *'Indian Philosophy'*.
4. B K Matilal, '*The Character of Logic in India'*.
5. '*UGC–IKS Documents and AICTE IKS Modules'*.
6. David Frawley, '*Ayurvedic Healing'*.
7. *'IIT-IKS Foundation Course Materials'*.
8. 'Ministry of Education – IKS Portal Resources'.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the core concepts and evolution of Indian Knowledge Systems.	**K2**
CO2	Interpret Indian views on human development, ethics, and sustainability.	**K3**
CO3	Apply IKS principles to sustainable living and professional practices.	**K3**
CO4	Demonstrate social, ecological, and ethical responsibility in real-life situations.	**K3**

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						3	2				3
CO2						3	3				2
CO3			2			3	3		2	2	
CO4				2		3	3	2			
			2	**2**		**3**	**3**	**2**	**2**	**2**	**3**

1 - low, 2- medium, 3 - high

25MC006 STRATEGIC DATA MANAGEMENT AND GOVERNANCE
(Common to all B.E./B.Tech. Programmes)

2 0 0 0

INTRODUCTION TO STRATEGIC DATA MANAGEMENT Data and Its strategic Value; Types of Data, Data as a Source of Competitive Advantage; The Data Lifecycle; Aligning Data Management with Business Goals; Data Management challenges in Contemporary Organizations; Overview of Data driven Decision making. **(6)**

DATA GOVERNANCE AND FRAMEWORK Introduction to Data Governance; Data Management Frameworks (DAMA-DMBOK, COBIT, ISO Data management Standards); Structuring Data Leadership Roles; Implementation of Data Policies and Standards. Master Data Management (MDM) and API Integration. **(6)**

DATA PRIVACY, ETHICS AND QUALITY MANAGEMENT Data Privacy and Protection Regulations (DPDP Act, GDPR); Principles and Importance of Ethical data management; Ethical decision-making models; Key data Quality Dimensions; Role of Data Quality in Effective Decision-Making; Tools and techniques for ensuring data quality. **(6)**

DATA LITERACY AND ORGANIZATIONAL TRANSFORMATION Role of Data Literacy in Modern Organisations; Strategies for implementing data-driven transformation; Communication and training for Overcoming Resistance to Change; Cross-Functional Collaboration across Organisational Departments; Fostering a Data-Driven Culture. **(6)**

DATA ARCHITECTURE AND RECENT TRENDS Business Intelligence (BI) Architecture; Big Data Ecosystem; AI/ML data pipelines in Business enterprises, Strategic Planning for Data Infrastructure; Build vs. Buy Decisions for Data Platforms; Generative AI in Data Management. **(6)**

Total L: 30 periods

TEXT BOOKS

1. Ladley, J. & Ladley, A. '*Data Governance: How to Design, Deploy, and Sustain an Effective Data Governance Program* (3rd ed.)'. Morgan Kaufmann (Elsevier).
2. Eryurek, E., Gilad, U., Kaye, B., Sicular, S., & Schur, E. (2021). '*Data Governance: The Definitive Guide: People, Processes, and Tools to Operationalize Data Trustworthiness'*. O'Reilly Media.

REFERENCE BOOKS

1. Plotkin, D. (2020). '*Data Stewardship: An Actionable Guide to Effective Data Management and Data Governance* (2nd ed.)'. Academic Press (Elsevier).2020.
2. DAMA International. (2024). '*DAMA-DMBOK: Data Management Body of Knowledge* (2nd ed. Revised)'. Technics Publications.2024.
3. Loukides, M., Mason, H., & Patil, D. J. (2018). '*Ethics and Data Science'*. O'Reilly Media.2018.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understanding the Management role in leveraging data for competitive advantage and strategic decision-making.	**K2**
CO2	Applying governance frameworks to design policies, roles, and standards.	**K3**
CO3	Analyzing ethical challenges in data management to improve data-literacy across organization departments.	**K4**
CO4	Evaluating enterprise data architecture and modern platforms for making strategic decisions on Data Management.	**K5**

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2				3				3	3
CO2			2			2	3	2		3	
CO3						3	3		3		2
CO4	2		2	2	3	2				3	2
	2	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**

1 - low, 2- medium, 3 - high

25MC007 PROFESSIONAL ETHICS
(Common to all B.E./B.Tech. Programmes)

2 0 0 0

INTRODUCTION TO THE CONCEPTS OF ETHICS: Introduction to ethics – meaning, definition, dimensions of ethics, determinants and consequences of ethics; ethical dilemmas – types of ethical dilemmas. Morality – definition, types of moral values, levels of moral development. Ethics Versus morality. Professional Ethics – definition, components, types and significance. **(6)**

PSYCHOLOGY OF ETHICAL BEHAVIOR: Attitude – components of attitude in promoting ethical behavior; Motivation – human drives as a trigger for ethical behavior; Role of Cognitive biases (self-serving bias, incrementalism and overconfidence bias) in shaping ethical behavior. **(6)**

WORKPLACE ETHICAL BEHAVIORS: Integrity, honesty, accountability, responsibility, fairness, civic virtue, conscientiousness, empathy, self-confidence, character, respect for others, transparency, loyalty. **(6)**

APPLICATION AREAS OF ETHICS: Application of Ethics in different fields - Engineering ethics, medical ethics, financial ethics, technological ethics, scientific ethics, legal ethics, business ethics, environmental ethics. **(6)**

INDICATORS OF PROFESSIONAL ETHICS IN ORGANIZATIONS: Corporate Governance – Definition, importance, Theories of Corporate Governance: Agency Theory, Stewardship theory, Stakeholder Theory, Resource Dependency Theory. Corporate Social Responsibility – Definition, Models of CSR. **(6)**

Total L: 30 periods

TEXT BOOKS

1. Govindarajan M, Natarajan S and Senthil Kumar VS, *'Engineering Ethics'*. Prentice Hall of India, New Delhi, 2013.
2. Stephen P. Robbins, *'Essentials of Organizational Behavior'.* Pearson Education, 2023.
3. Subramanian. R. '*Professional Ethics'*. Oxford Publication, 2013.
4. Nagarasan. R.S. *Professional Ethics and Human Values'.* New Age International Publications, 2006.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understand the fundamental concepts of ethics, morality and the psychological principles behind ethical behavior.	**K2**
CO2	Demonstrate the application of core ethical values in the different situations of the workplace.	**K3**
CO3	Analyze the ethical issues, challenges in different professional domains and the application of ethical principles to solve the issues	**K4**
CO4	Evaluate the relevance and effectiveness of corporate governance theories and CSR models in addressing ethical and managerial challenges in organizations.	**K5**

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						2	3				3
CO2						2	3	3	2		
CO3		2	2			3	3				
CO4						3	3	2		3	2
		2	**2**			**3**	**3**	**3**	**2**	**3**	**3**

1 - low, 2- medium, 3 - high

25HSO01 PHYSICAL EDUCATION
(Common to all B.E./B.Tech. Programmes)

0 0 2 0

INTRODUCTION TO PHYSICAL EDUCATION: Importance and scope of physical education, Physical fitness and exercise fundamentals, Conditioning and calisthenics exercises, Posture, flexibility, balance, and coordination, Warm-up, cool-down, and relaxation techniques, Basics of injury prevention and first aid practices, Importance of teamwork, discipline, and sportsmanship.

BASIC GYMNASTICS AND MOVEMENT EXERCISES: Warm-up exercises, conditioning drills, movement education, balance exercises, floor exercises, tumbling basics, swinging and grip exercises, simple apparatus activities, lead-up games, coordination drills, and safety practices.

SKILL DEVELOPMENT IN ANY ONE OF THE FOLLOWING OUTDOOR GAMES: Basketball, Volleyball, Ball Badminton, and Football.

SKILL DEVELOPMENT IN ANY ONE OF THE FOLLOWING INDOOR GAMES: Shuttle Badminton, Chess, Carrom, and Table Tennis.

Total P: 30 Periods

WEIGHTAGE
Continuous Assessment: 100%

ASSESSMENT
- Attendance and Participation – 70%
- Practical Assessment of Physical Fitness and Sports Skills – 30%

REFERENCES

1. Singh, A. '*Essentials of Physical Education'*. Kalyani Publishers.
2. Kamlesh, M.L. '*Psychology in Physical Education and Sport'*.
3. Mangal, S.K. '*Psychology of Sports Performance'*. Sports Publication.
4. Kandappan, K. '*Foundations of Physical Education'*. Friends Publications.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate basic movement, balance, coordination, and fitness exercises with proper technique and safety awareness.	**K2**
CO2	Demonstrate physical fitness parameters such as endurance, agility, flexibility, speed, and strength through regular participation in physical activities.	**K2**
CO3	Develop teamwork, discipline, leadership qualities, and sportsmanship through participation in games and group activities.	**K3**
CO4	Adopt active lifestyle habits and participate regularly in physical and recreational activities for overall well-being.	**K3**

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1							2	3			2
CO2						2		3			3
CO3							3	3	2		2
CO4						2	2	3			3
						2	**3**	**3**	**2**		**3**

1 - low, 2- medium, 3 - high

25HSO02 YOGA AND HEALTH
(Common to all B.E./B.Tech. Programmes)

0 0 2 0

INTRODUCTION TO YOGA: Yoga as a tool for physical and mental wellness, Importance of posture, breathing, relaxation, and mindfulness, Role of yoga in stress management and lifestyle balance, Basic guidelines and safety precautions for yoga practice, Introduction to healthy habits including sleep hygiene, nutrition, and digital well-being

SURYA NAMASKAR – TYPES OF POSTURES: Pranamasana (Prayer Pose), Hastauttanasana (Raised Arms Pose), Padahastasana / Hastapadasana (Standing Forward Bend), Ashwa Sanchalanasana (Equestrian Pose), Dandasana (Plank Pose), Ashtanga Namaskara (Eight-Limbed Salutation), Bhujangasana (Cobra Pose), Adho Mukha Svanasana (Downward-Facing Dog), Ashwa Sanchalanasana (Equestrian Pose), Padahastasana (Standing Forward Bend), Hastauttanasana (Raised Arms Pose), and Pranamasana (Prayer Pose).

BASIC ASANAS:

1. Standing – Tadasana, Utkatasana, Trikonasana, Virabhadrasana, and Vrikshasana
2. Sitting – Sukhasana, Dandasana, Paschimottanasana, Vajrasana, and Gomukhasana
3. Prone Position – Bhujangasana, Salabhasana, Dhanurasana, Makarasana, and Urdhva Mukha Svanasana
4. Supine Position – Apanasana, Viparita Karani, Supta Baddha Konasana, Ardha Halasana, and Savasana

PRANAYAMA TECHNIQUES & MUDRAS: Ujjayi, Nadi Shodhana, Sheetali, Sitkari, Kapalabhati, Bhastrika, and Bhramari. Gyan Mudra (Chin Mudra), Prana Mudra, Apana Mudra, Vayu Mudra, Prithvi Mudra, Varun Mudra, Surya Mudra, Shunya Mudra, Linga Mudra, and Anjali Mudra.

Total P: 30 Periods

WEIGHTAGE: Continuous Assessment: 100%
ASSESSMENT METHODOLOGY: Attendance and Participation – 70%, Practical Demonstration (Surya Namaskar, Asanas, and Pranayama) – 30%

REFERENCES

1. *'The Heart of Yoga'.* – T.K.V. Desikachar
2. *'Yoga for Holistic Health'.* – Dr. H.R. Nagendra
3. *'Light on Yoga'.* – B.K.S. Iyengar
4. *'Asana Pranayama Mudra Bandha'.* – Swami Satyananda Saraswati

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate Surya Namaskar and basic asanas in standing, sitting, prone, and supine positions with correct alignment and breathing.	**K2**
CO2	Demonstrate pranayama techniques for stress management and respiratory health.	**K2**
CO3	Improve flexibility, balance, posture, breathing efficiency, and relaxation through regular yoga practice.	**K3**
CO4	Apply principles of healthy living such as nutrition, sleep hygiene, and digital well-being in daily life.	**K3**

COs - POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1							2	3			2
CO2						2	2				2
CO3						2	2	3			3
CO4						3	2	2			3
						3	**2**	**3**			**3**

1-low, 2-Medium, 3-High