B.E. MECHANICAL ENGINEERING

CREDIT DISTRIBUTION,

SCHEDULING OF COURSES

and

I & II SEMESTER

CORE AND ENGINEERING SCIENCE COURSE

FOR THE STUDENTS ADMITTED

FROM

THE ACADEMIC YEAR

2026-27 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING

(A Government Aided Autonomous Institution affiliated to Anna University)

MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41

Fax: 0452 2483427
Web: www.tce.edu

Passed in Board of Studies on 22.05.2026 Approved in 71th Academic Council meeting on 27.06.2026

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015

B. E./ B.Tech. DEGREE PROGRAMMES

CREDIT DISTRIBUTION

(For the students admitted from the Academic Year 2026-27 onwards)

Sl. No.	Category	Credits	
		Regular	**Lateral Entry**
A.	Humanities and Social Sciences including Management Courses (HSMC)	11	8
B.	Basic Science Courses (BSC)	22	6
C.	Engineering Science Courses (ESC)	23	12
D.	Program Core Courses (PCC)	75	62
E.	Program Elective Courses (PEC)	21	21
F.	Open Elective Courses (OEC)	6	6
G.	Employability Enhancement Courses (EEC)	16	16
H.	Internship and Mandatory Audit Courses (AC) as per Regulatory authorities (Non-Credit and not included in CGPA)	-	-
Minimum Credits to be earned for the award of the Degree		**174**	**131**
		From A to G and the successful completion of H	

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI – 625 015

DEPARTMENT OF MECHANICAL ENGINEERING

Vision:

"Be a globally renowned school of engineering in mechanical sciences"

Mission of the Department:

As a department, we are committed to

1 Develop ethical and competent engineers by synergizing world class teaching, learning and research.

2 Establish state-of-art laboratories and to provide consultancy services to fulfil the expectations of industry and needs of the society.

3 Inculcate entrepreneurial qualities for creating, developing and managing global Engineering ventures.

4 Motivate the students to pursue higher studies and research.

Programme Educational Objectives (PEOs) of B.E. (Mechanical Engineering)

PEO1: The programme will prepare graduates for successful careers in design, manufacturing, service and process industries, research and development organizations and academic institutions

PEO2: The programme will prepare graduates with aspiration for higher studies and research

PEO3: The programme will prepare graduates with entrepreneurial and self-learning capabilities to excel in their profession

PEO4: The programme will prepare graduates to work with ethical values in diverse teams

Programme Outcomes (POs) of B.E. (Mechanical Engineering)

Graduating students of B.E. Mechanical Engineering Programme will have

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

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

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

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

PO5: 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)

Programme Specific Outcomes (PSOs) of B.E. (Mechanical Engineering)

Graduating students of B.E. (Mechanical Engineering) programme will be able to:

PSO1: Design mechanical components/subsystem(s), prepare production drawings using CAD tools and select suitable manufacturing processes.

PSO2: Formulate and analyze energy and mass flow in thermal devices.

PSO3: Design, analyze, optimize and realize mechanical processes/systems to meet industrial competitiveness.

Mapping of PEOs with Mission

PEO Statements	M1 Ethical and competent engineers	M2 State-of-art laboratories	M3 Entrepreneurial qualities	M4 Higher studies and research
PE01:	**3**	**3**	**3**	**2**
PE02:	**3**	**3**	**2**	**3**
PE03:	**2**	**2**	**3**	**2**
PE04:	**3**	**2**	**2**	**2**

Knowledge and Attitude Profile (WK)

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

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

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

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

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

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

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

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

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

SCHEDULING OF COURSES

SEMESTER	Theory/Theory cum Practical / Practical											CDIO COURSES	AUDIT COURSES	Credits
Sem 1	**26MASA0**	**26PHSA0**	**26EGHA0**	**26MECA0**				**26MEEA0**	**26MECB0**		**26PHSB0**	**26CCEA0**		
	Applied Calculus for Engineers	Physics	Technical English (TCP)	Engineering Mechanics				Engineering Graphics (TCP)	Workshop		Physics Laboratory	Introduction to Engineering (TCP)	**26TAAA0**- Heritage of Tamil / **26CCAA0**- Vision and speed maths	**20.5**
	(BSC-4)	(BSC-3)	(HSMC-3)	(PCC-3)				(ESC-3)	(PCC-1)		(BSC-1.5)	(ESC-2)	(AC-0)	
SEM 2	**26MESA0**	**26CHSA0**	**26MECC0**	**26MECD0**				**26MEEB0**	**26MECE0**	**26MECF0**	**26CHSC0**	**26CCEB0**		
	Linear Algebra and Vector Calculus	Engineering Chemistry	Engineering Thermodynamics	Metal Casting and Forming, Joining and Sheet Metal Working				Engineering Materials and Metallurgy	Manufacturing Processes Laboratory	Metallurgy and Material Testing Laboratory	Chemistry Laboratory	Biology for Engineers	**26TAAB0**- Tamil and Technology / **26CCAB0**- Foundations of Problem Solving-1	**22.5**
	(BSC-3)	(BSC-3)	(PCC-3)	(PCC-4)				(ESC-3)	(PCC-1)	(PCC-1)	(BSC-1.5)	(ESC-3)	(AC-0)	
Sem 3	**26MESB0**	**26MECG0**	**26MECH0**	**26MECJ0**	**26MECK0**			**26MEEC0**	**26MECL0**		**26CCLA0**	**26CCEC0**	**26CCAC0**	
	Maths-III	Mechanics of Materials	Thermal Engineering	Machining Processes	Computer Aided Production Drawing			Python Programming (TCP)	Thermal Engineering Laboratory		Building Communication Skills	Design Thinking	Constitution of India	**25**
	(BSC-3)	(PCC-3)	(PCC-3)	(PCC-3)	(PCC-4)			(ESC-4)	(PCC-1)		(EEC-1)	(ESC-3)	(AC-0)	
Sem 4	**26MESC0**	**26MECM0**	**26MECN0**	**26MECP0**	**26MTCP0**	**26MTCQ0**	**26MECQ0**		**26MECR0**	**26EGHB0**	**26CCLB0**	**26CCED0**	**26CCAD0**	
	Maths-IV	Kinematics and Dynamics of Machinery	Fluid Mechanics and Machines	Metrology and Quality control	Electrical Engineering and Drawing (TCP)	Industrial Hydraulic and Pneumatic Engineering (TCP)	Total Productive Maintenance (TCP)		Machining Practices & Metrology Laboratory	Professional Communication Laboratory	Numerical Skills and Quantitative Problem Solving	Environment and Sustainability	Indian Knowledge System	**26**
	(BSC-3)	(PCC-3)	(PCC-3)	(PCC-3)	(PCC-3)	(PCC-2)	(PCC-2)		(PCC-1)	(HSMC-2)	(EEC-1)	(ESC-3)	(AC-0)	

SCHEDULING OF COURSES

SEMESTER	Theory/Theory cum Practical / Practical											CDIO COURSES	AUDIT COURSES	Credits
Sem 5	26CCHA0	26MECS0	26MECT0		26MTCW0	26MECU0	26XXFX0	26MEED0	26MECV0	26MECW0	26CCLC0	26MELA0	26CCAE0	
	Project Management	Design of Machine Elements	Heat and Mass Transfer		Instrumentation and Control System (TCP)	Computer Aided Manufacturing (TCP)	Basic Science Elective / Language Elective	Servo Motor and drive	Hydraulics and CFD Laboratory	Dynamics and Quality Assurance Laboratory	Aptitude Skills	Project-I	Universal Human Values and Ethics	28
	(HSMC-3)	(PCC-3)	(PCC-3)		(PCC-4)	(PCC-3)	(OEC-3)	(ESC-2)	(PCC-1)	(PCC-1)	(EEC-2)	(EEC-3)	(AC-0)	
Sem 6	26CCHB0	26MECX0	26MECY0	26MECZ0	26MEDA0	26MEDB0	26XXGX0	26MEPX0	26MEDC0	26MEDD0		26MELB0	26CCAF0	
	Accounting and Finance	Finite Element Analysis	Design of Transmission Systems	Industrial Engineering	Automation (TCP)	Robotic Technology (TCP)	Interdisciplinary Elective	PEC-1	Heat Transfer Laboratory	Finite Element Analysis Laboratory		Project-II	Disaster Management	28
	(HSMC-3)	(PCC-3)	(PCC-2)	(PCC-2)	(PCC-3)	(PCC-4)	(OEC-3)	(PEC-3)	(PCC-1)	(PCC-1)		(EEC-3)	(AC-0)	
Sem 7	26MEPX0	26MEPX0	26MEPX0	26MEPX0	26MEPX0	26MEPX0						26MELC0		
	PEC-2	PEC-3	PEC-4	PEC-5	PEC-6	PEC-7						Project-III		21
	(PEC-3)	(PEC-3)	(PEC-3)	(PEC-3)	(PEC-3)	(PEC-3)						(EEC-3)		
Sem 8												26MELD0		
												Project-IV		3
												(EEC-3)		
				CATEGORY		HSMC	BSC	ESC	PCC	PEC	OEC	EEC	TOTAL	174
				CREDITS		11	22	23	75	21	06	16		

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI–625015
B.E. (MECHANICAL ENGINEERING)
COURSE OF STUDY

FIRST SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26MASA0	Applied Calculus for Engineers	BSC	3	1	0	4
26PHSA0	Physics	BSC	2	1	0	3
26MECA0	Engineering Mechanics	PCC	3	0	0	3
THEORYCUM PRACTICAL						
26EGHA0	Technical English	HSMC	2	0	2	3
26MEEA0	Engineering Graphics	ESC	1	0	4	3
26CCEA0	Introduction to Engineering	ESC	1	0	2	2
PRACTICAL						
26MECB0	Workshop	PCC	0	0	2	1
26PHSB0	Physics Laboratory	BSC	0	0	3	1.5
AUDIT COURSE						
26TAAA0	Heritage of Tamil	AC	1	0	0	0
	(OR)					
26CCAA0	Vision and speed Maths	AC	0	0	2	
Total			**13**	**0**	**17**	**20.5**

SECOND SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26MESA0	Linear Algebra and Vector Calculus	BSC	2	1	0	3
26CHSA0	Engineering Chemistry	BSC	3	0	0	3
26MECC0	Engineering Thermodynamics	PCC	3	0	0	3
26MECD0	Metal Casting and Forming, Joining and Sheet Metal Working	PCC	4	0	0	4
26MEEB0	Engineering Materials and Metallurgy	ESC	3	0	0	3
26CCEB0	Biology for Engineers	ESC	3	0	0	3
PRACTICAL						
26MECE0	Manufacturing Processes Laboratory	PCC	0	0	2	1
26MECF0	Metallurgy and Material Testing Laboratory	PCC	0	0	2	1
26CHSC0	Chemistry Laboratory	BSC	0	0	3	1.5
AUDIT COURSE						
26TAAB0	Tamil and Technology	AC	1	0	0	0
	(OR)					
26CCAB0	Foundations of Problem Solving-1	AC	0	0	2	
Total			**19**	**1**	**9**	**22.5**

BSC : Basic Science Course
HSMC : Humanities and Social Sciences including Management Course
ESC : Engineering Science Course
PCC : Programme Core Course
PEC : Programme Elective Course
OEC : Open Elective Course
EEC : Employability Enhancement Course
AC : Audit Course

L : Lecture
T : Tutorial
P : Practical

26MASA0	APPLIED CALCULUS FOR ENGINEERS	Category	L	T	P	Credit
		BSC	3	1	0	4

1. Preamble

Applied calculus addresses the fundamental concepts of single and multivariable calculus with emphasis on engineering applications and problem solving. Focuses on modeling and analysis of engineering systems through derivatives and integrals. Develops analytical skills to analyze and solve real-world systems using derivatives and multiple integrals.

2. Prerequisite

- Nil

3. Course Outcome

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

CO	Course Outcomes	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Use functions, limits, continuity, and derivatives to solve mathematical and technical problems.	TPS3	1.1.1	18%	SDG4	2
CO2	Apply derivatives to determine extrema and characterize behavior of single variable functions.	TPS3	1.1.1	18%	SDG4	2
CO3	Compute partial derivatives to determine extrema of multivariable functions.	TPS3	1.1.1	18%	SDG4	2
CO4	Apply techniques of double integrals to compute areas and volumes of bounded regions.	TPS3	1.1.1	16%	SDG4	2
CO5	Apply double integrals to determine physical quantities such as density,mass, moments, center of mass, and moments of inertia and Surface Area.	TPS3	1.1.1	12%	SDG4	2
CO6	Compute volumes using triple integrals in Cartesian, Cylindrical, and Spherical coordinates.	TPS3	1.1.1	18%	SDG4	2

4.Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	33	33			18
CO2	33	33			18
CO3	34	34			18
CO4			38	38	16
CO5			24	24	12
CO6			38	38	18
Total	100	100	100	100	100

Activities are given for self-study using mathematical software. They can be tested through open ended assignments.

5.Syllabus

Foundations of Differential Calculus: New functions from old functions - Limit of a function and Continuity of a function - Limits at infinity - Derivative as a function.

Activities: Visualization of the functions, model and solve scientific and engineering phenomena using concept of function, limits, continuity, intermediate value theorem and derivatives. Solving Competitive Examination problems with emphasis to GATE

Applications of Differential Calculus: Maxima and Minima of functions of single variable - The Mean value theorem - Effect of derivatives on the shape of the graph of a function.

Activities: Model and solve scientific, engineering phenomena using concept of Maxima and Minima of a function, Rolle's Theorem and mean value theorem and derivatives. Solve Competitive Examination problems with emphasis to GATE

Partial Derivatives and its Applications: Partial derivatives - Chain rule - Maxima and minima of functions of two variables - Method of Lagrange's Multipliers for function with single constraint.

Activities: Model and solve scientific, engineering phenomena using concept Partial derivatives, Chain rule, Maxima and minima of functions of two variables, Method of Lagrange's Multipliers. Solve Competitive Examination problems with emphasis to GATE.

Double Integrals and its Applications: Iterated integrals and Fubini's theorem - Double integrals over general regions - Changing the order of integration - Properties of double integrals - Double integrals in polar coordinates – Applications of double integrals (Density, Mass, Moments & Moments of Inertia problems only) - Surface area.

Activities: Using the concept of Double integrals, model and solve scientific, engineering phenomena. Solve Competitive Examination problems with emphasis to GATE

Triple Integrals and its Applications: Triple integrals over rectangular boxes - Triple integrals over general regions - Triple integrals in cylindrical coordinates - Triple integrals in spherical coordinates.

Activities: Model and solve scientific, engineering phenomena using concept of Triple integrals in Cartesian, cylindrical and spherical coordinates. Solve Competitive Examination problems with emphasis to GATE.

6. Learning Resources

6.1 Text Book

1) James Stewart, Daniel Clegg and Saleem Watson, "Calculus Early Transcendentals", 9th edition, Cengage Learning, New Delhi, 2019.
   Foundations of Differential Calculus: [1.3, 2.2, 2.5, 2.6, 2.8]
   Applications of Differential Calculus: [4.1, 4.2, 4.3]
   Partial Derivatives and its Applications: [14.3, 14.5, 14.7, 14.8]
   Double Integrals and its Applications: [15.1, 15.2, 15.3, 15.4, 15.5]
   Triple Integrals and its Applications: [15.6, 15.7, 15.8]

6.2 Reference Books & Web Resources

1) George B. Thomas, "Thomas Calculus: Early Transcendentals", 14th Edition, Pearson Publishers, New Delhi, 2018.
2) Howard Anton, Irl Bivens and Stephen Davis, "Calculus: Early Transcendentals",12thedition, John Wiley & Sons, 2021.
3) Kuldeep Singh, "Engineering Mathematics Through Applications", 2nd edition, Blooms berry publishing, 2019,
4) Kuldip S. Rattan, Nathan W. Klingbeil, Craig M. Baudendistel, "Introductory Mathematics for Engineering Applications", 2nd edition, John Wiley& Sons, 2021.
5) Ron Larson and David C. Falvo, "Calculus: an Applied Approach". 10th edition Cengage Learning 2015.
6) https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_ma79
7) https://ocw.mit.edu/courses/18-01-calculus-i-single-variable-calculus-fall-2020/
8) https://in.mathworks.com/matlabcentral/fileexchange/?q=calculus+applications

7. Course Contents and Lecture Schedule

Module No.	Topic	Periods
1	**Foundations of Differential Calculus**	
1.1	New functions from old functions	1
1.2	The Limit of a function	1
1.3	Continuity of a function	1
	Tutorial	1
1.4	Limits at infinity	1
1.5	The Derivative as a function	2
	Tutorial	1
2	**Applications of Differential Calculus**	
2.1	Maxima and Minima of functions of single variable	3
	Tutorial	1
2.2	The Mean value theorem	1
2.3	Effect of derivatives on the shape of a graph of a function	2
	Tutorial	1
3	**Partial Derivatives and its Applications**	
3.1	Partial derivatives	1
3.2	Chain rule	2
	Tutorial	1

3.3	Maxima and minima of functions of two variables	1
3.4	Method of Lagrange's Multipliers for function with single constraint	2
	Tutorial	1
4	**Double Integrals**	
4.1	Iterated integrals and Fubini's theorem	1
4.2	Double integrals over general regions	2
	Tutorial	1
4.3	Changing the order of integration	2
4.4	Properties of double integrals (without proof), Change of Variables from Cartesian to Polar Coordinates	1
	Tutorial	1
4.5	Double Integrals in Polar coordinates	1
4.6	Applications of double integrals (Density, Mass, Moments)	1
4.7	Applications of double integrals (Moments of Inertia)	1
	Tutorial	1
4.8	Surface area	2
5	**Triple Integrals**	
5.1	Triple integrals over Rectangular Boxes	1
	Tutorial	1
5.2	Triple integrals over general regions	2
5.3	Change of Variables from Cartesian to Cylindrical and Spherical Coordinates	1
	Tutorial	1
5.4	Triple integrals in cylindrical coordinates	2
5.5	Triple integrals in spherical coordinates	1
	Tutorial	1
	Total	**48**

8.Course Designer(s):

1. Dr. B. Vellaikannan, Professor, Dept. of Mathematics, bvkmat@tce.edu
2. Dr. C. S.Senthilkumar , Assistant Professor, Dept. of Mathematics, kumarstays@tce.edu
3. Dr. A. Anitha, Assistant Professor, Dept. of Mathematics, anithavalli@tce.edu
4. Ms.H. Srivinodhini, Assistant Professor, Dept. of Mathematics, srivinodhini@tce.edu
5. Dr. S. Saravanakumar, Assistant Professor, Dept. of Mathematics, sskmat@tce.edu
6. Dr. P. Balamanikandan, Assistant Professor, Dept. of Mathematics, pbmmat@tce.edu
7. Dr. Pradnya Gaonkar, Senior customer success engineer, math works pgaonkar@mathworks.com

26PHSA0	PHYSICS (COMMON TO ALL BRANCHES)

Category*	L	T	P	Credit
BSC	2	1	0	3

1. Preamble

Physics provides a strong foundation in classical and modern physics, including mechanics, wave phenomena, electrodynamics, electronic materials, and quantum theory, relevant to engineering applications. This course connects fundamental principles with modern technologies such as solar cells, electric vehicles, MRI scanners, scanning tunneling microscopes, and emerging quantum technologies.

2. Prerequisite

Physics and Mathematics at Higher Secondary Level (Class XII)

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Apply the principles of mechanics of solids, including the work-energy theorem, central forces, conservation of angular momentum, and coordinate transformations, to solve problems on satellite maneuvers.	TPS3	1.2.1	15	SDG 9	1
CO2	Apply the equations of oscillatory and wave motion to solve problems on damped and forced oscillations, Q factor, impedance matching, phase and group velocity, and dispersive wave phenomena.	TPS3	1.2.1	15	SDG 11	1
CO3	Apply Maxwell's equations and Poynting's theorem to solve problems on electromagnetic wave propagation, polarization, and energy-momentum transport in vacuum and conducting media.	TPS3	1.2.1	18	SDG 3	1
CO4	Apply band theory, carrier transport equations, and Fermi level concepts to compute carrier concentration and solve problems related to the operation of solar cells, batteries, supercapacitors, and EV materials.	TPS3	1.2.1	18	SDG 7	2
CO5	Apply the Schrodinger wave equation and quantum mechanical principles to solve problems on a particle in a 1D	TPS3	1.2.1	17	SDG 4	0

	box, a quantum harmonic oscillator, and tunneling as realized in the scanning tunneling microscope.					
CO6	Apply the principles of superposition, entanglement, and quantum logic gates to solve problems, illustrating the fundamental operational differences between classical and quantum computing using qubit representations.	TPS3	1.4.1	17	SDG 9	1

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	35	35	—	—	15
CO2	35	35	—	—	15
CO3	30	30	—	—	18
CO4	—	—	35	35	18
CO5	—	—	35	35	17
CO6	—	—	30	30	17
Total	**100**	**100**	**100**	**100**	**100**

Note: CO-wise assessment must align with CO weightage.

5. Syllabus

Module 1: Mechanics of Solids (6 hrs)

Scalars and Vectors Under Rotation Transformation – Work-Energy Theorem – Central Forces – Energy in Conservative and Non-Conservative Forces – Conservation of Angular Momentum – Coordinate Systems: Cartesian, Polar, Cylindrical – Satellite Maneuvers.

Module 2: Oscillations and Waves (6 hrs)

Oscillatory Motion – Damped Oscillations – Forced Oscillations (Qualitative only): Differential Equation and its Solution – Q Factor – Impedance Matching – Group Velocity and Phase Velocity – Non-Dispersive Transverse and Longitudinal Waves in a String – Dispersive Waves – Seismic Waves – Water Waves and Tsunamis.

Module 3: Electrodynamics (6 hrs)

Maxwell's Equations of Electromagnetism – Equation of Continuity – Poynting's Theorem – Electromagnetic Waves – Polarization – EM Waves in Vacuum and Conductors – Energy and Momentum in EM Waves – Application: CT/MRI Scan.

Module 4: Physics of Electronic Materials (6 hrs)

Band Theory of Solids – Kronig-Penney Model (Qualitative only) – Bloch's Theorem – Intrinsic and Extrinsic Semiconductors – Carrier Concentration and Fermi Level – Electron and Hole Transport – Solar Cells – Charge Storage in Batteries and Supercapacitors – Materials for Electric Vehicles (EV) – 2D Materials, Flexible Electronic Materials, and Quantum Materials.

Module 5: Quantum Mechanics (6 hrs)

Wave Nature of Particles – Wave Function – Expectation Values – Schrodinger Wave Equations – Uncertainty Principle – Particle in a 1D Box – Quantum Harmonic Oscillator – Quantum Tunnelling (Qualitative only) – Scanning Tunneling Microscope.

Module 6: Quantum Computing (6 hrs)
Quantum Computing – Classical and Quantum Computing: Key Differences – Bloch Sphere Representation of Qubits – Types of Qubits – Superposition – Quantum Entanglement – Quantum Logic Gates.

6. Learning Resources

6.1 Text Book

1. H. D. Young and R. A. Freedman, "University Physics with Modern Physics", Pearson Education, 15th Edition, 2023.
2. D. J. Griffiths, "Introduction to Electrodynamics", Cambridge University Press, 4th Edition, 2017.
3. M. Mahendran, M. Tamilelakkiya, S. Karthickprabhu, P. Sivakumar, “Engineering Physics” , Shanlax Publications, 1st edition, 2026.

6.2 Reference Books & Web resources

1. S. O. Pillai, "Solid State Physics", New Age International Publishers, 8th Edition, 2018.
2. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.
3. R. P. Feynman, R. B. Leighton and M. Sands, "The Feynman Lectures on Physics – Vol. I, II & III", Addison-Wesley, 2011.
4. NPTEL Course: "Engineering Physics" – https://nptel.ac.in
5. MIT OpenCourseWare: "Physics II: Electricity and Magnetism" – https://ocw.mit.edu

7. Course Contents and Lecture Schedule

Module	Topics	Periods
1	Scalars and Vectors Under Rotation Transformation	1
	Work-Energy Theorem; Central Forces	1
	Energy in Conservative and Non-Conservative Forces; Conservation of Angular Momentum	1
	Coordinate Systems: Cartesian, Polar, Cylindrical	2
	Satellite Maneuvers	1
2	Oscillatory Motion; Damped Oscillations	1
	Forced Oscillations – Differential Equation and Solution; Q Factor; Impedance Matching	2
	Group Velocity and Phase Velocity; Non-Dispersive Waves in a String	1
	Dispersive Waves; Seismic Waves; Water Waves and Tsunamis	2
3	Maxwell's Equations, Equation of Continuity	2
	Poynting's Theorem; Electromagnetic Waves; Polarization	1
	EM Waves in Vacuum and Conductors; Energy and Momentum in EM Waves	2

	Application: CT/MRI Scan	1
4	Band Theory of Solids; Kronig-Penney Model (Qualitative); Bloch's Theorem	1
	Intrinsic and Extrinsic Semiconductors; Carrier Concentration and Fermi Level	2
	Electron and Hole Transport; Solar Cells	1
	Charge Storage in Batteries and Supercapacitors; EV Materials, Flexible Electronic Materials, 2D and Quantum Materials	1
5	Wave Nature of Particles; Wave Function; Expectation Values	1
	Schrodinger Wave Equation (Time-dependent and Time-independent)	2
	Uncertainty Principle; Particle in a 1D Box	2
	Quantum Harmonic Oscillator; Quantum Tunnelling (Qualitative); Scanning Tunneling Microscope	1
6	Classical vs Quantum Computing: Qubit – Definition and Types	1
	Bloch Sphere Representation; Superposition	2
	Quantum Entanglement; Quantum Logic Gates	2
	Case Study: Quantum Computing Applications	1
	Total Periods	36

SDG-Aligned Academic Activities

CO	SDG	Activity	Linkage to Module	TPS	Level
CO1	SDG 9	Compute orbital velocity, period, and energy for a satellite executing a Hohmann transfer between circular orbits using conservation of angular momentum and the work-energy theorem.	Module 1 – Satellite Maneuvers	TPS 3	1
CO2	SDG 11	Use the forced-oscillation model to compute the resonant frequency and Q-factor for a seismic sensor and relate impedance matching to signal fidelity in earthquake early-warning systems.	Module 2 – Forced Oscillations, Seismic Waves	TPS 3	1
CO3	SDG 3	Apply Poynting's theorem to compute the power density of EM waves used in MRI and CT imaging and use polarization principles to	Module 3 – Poynting's Theorem, CT/MRI Scan	TPS 3	1

		explain contrast differentiation in medical scans.			
CO4	SDG 7	Compute the efficiency of a p-n junction solar cell using given carrier concentration and Fermi level data and solve charge storage problems for a supercapacitor in an EV energy management scenario.	Module 4 – Solar Cells, EV Materials, Supercapacitors	TPS 3	2
CO5	SDG 4	Solve the particle-in-a-1D-box problem for a quantum dot of given dimensions, compute allowed energy levels and use the tunneling probability formula to explain STM tip-sample distance sensitivity.	Module 5 – Particle in 1D Box, Quantum Tunnelling, STM	TPS 3	0
CO6	SDG 9	Apply Hadamard and CNOT gate matrices to given qubit input states, trace the state on the Bloch sphere, and demonstrate the creation of entangled Bell states using quantum logic gate sequences.	Module 6 – Quantum Logic Gates, Entanglement	TPS 3	1

8.Course Designer(s):

Dr. M. Mahendran manickam-mahendran@tce.edu
Dr. M. Tamilelakkiya mtphy@tce.edu
Dr. S. Karthickprabhu skphy@tce.edu

26MECA0	ENGINEERING MECHANICS	Category	L	T	P	Credits	TE Type
		PCC	3	0	-	3	Theory

Preamble

Engineering Mechanics is the branch of engineering science that studies the behaviour of bodies under the action of forces. It deals with the conditions of rest and motion of particles and rigid bodies. The subject is broadly divided into Statics and Dynamics, which help in analyzing equilibrium and motion of engineering systems. Engineering Mechanics forms the foundation for the design and analysis of structures, machines, and mechanical components used in various engineering applications.

Prerequisite

Nil

Course Outcomes

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

CO No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Apply the concept of static equilibrium in particles and rigid bodies and solve mechanical engineering problems	TPS3	1.3.1	20	SDG9	2
CO2	Compute the frictional forces for mechanical components.	TPS3	1.2.1	10	SDG9	2
CO3	Determine the centre of gravity and moment of inertia of the given geometry.	TPS3	1.1.1	20	SDG9	2
CO4	Apply the concepts of particle kinematics and solve complex mechanical engineering problems.	TPS3	2.4.1	15	SDG4	2
CO5	Apply the concept of the kinetics of particles (Newton's law of motion, Work energy and Impulse-momentum principles) and solve mechanical engineering problems	TPS3	2.4.1	20	SDG9	2
CO6	Apply the concept of dynamic equilibrium in kinematics and kinetics of rigid bodies and solve problems subjected to general planar motion using various principles.	TPS3	1.4.1	15	SDG9	2

Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	40	40			20
CO2	20	20			10
CO3	40	40			20
CO4			30	30	15
CO5			40	40	20
CO6			30	30	15
Total	**100**	**100**	**100**	**100**	**100**

Syllabus

Statics of Particles and Rigid Bodies:

Statics of Particles: Fundamental principles and concepts – Laws of mechanics – Principle of Transmissibility – Parallelogram, Triangle and Polygon law of forces – Resultant of concurrent and non-concurrent coplanar forces. Static Equilibrium–Conditions of equilibrium in statics – Lami's Theorem– Free body Diagram– Reactions.

Statics of Rigid bodies: Moment of a force – Varignon's theorem – Force Couple System – Reduction of system of forces into one force and couple – Equilibrium of rigid bodies in 2D.

Friction: Role of frictional force – Types of friction – Limiting friction – Coefficient of friction and angle of friction – Coulomb's law of friction – Angle of Repose – Wedge friction – Belt friction.

Centroid, Centre of Gravity and Moment of Inertia - Centroid and Centre of Gravity – Simple and Composite plane figures and solid bodies – Pappus and Guldinus Theorem- Area Moment of Inertia – Parallel and Perpendicular Axis Theorem – Polar Moment of Inertia – Radius of gyration – Mass Moment of Inertia – Simple and Composite plane figures and solid bodies;

Dynamics of Particles and Rigid Bodies:

Kinematics of Particles: Rectilinear Motion – Uniform and Variable acceleration – Motion of particle under gravity – Relative motion -Curvilinear motion

Kinetics of Particles: Newton's Second Law of Motion – D'Alembert's Principle. Work energy principle – Conservation of energy. Impulse-Momentum principle – Conservation of linear momentum – Motion of singular body and connected bodies.

Kinematics and Kinetics of Rigid Bodies: Relationship between angular motion and linear motion. Uniformly accelerated rotation- Kinematics of General plane motion - Instantaneous Axis of rotation- Kinetics of rolling bodies- Kinetics of General Plane motion.

Learning Resources

Text Book

1. Beer F.P. and Johnston Jr. E.R., 'Vector Mechanics for Engineers: Statics and Dynamics', Twelfth Edition, Tata McGraw Hill,2019.
2. Meriam J.L and Kraig L.G, 'Engineering Mechanics-Statics and Dynamics', John Wiley & sons, New York, EighthEdition,2016.
3. Velamurali., 'Engineering Mechanics: Statics and Dynamics' Oxford Higher education, Second Edition, 2018

Reference Books & Web resources

1. R.C. Hibbeller, 'Engineering Mechanics: Statics & Dynamics', Prentice Hall, , Thirteen Edition, 2013.

2. Palanichamy and Nagan S., 'Engineering Mechanics – Statics and Dynamics', Third Edition, TataMcGrawHill, 2005.
3. Rajasekaran and G. Sankara subramanian, 'Fundamentals of Engineering Mechanics', Vikas Publishing House Pvt. Ltd., New Delhi, Third Edition, 2005.
4. Sadhu Singh, 'Engineering Mechanics; Statics and Dynamics', Khanna publishers, New Delhi, Second Edition, 2004.
5. https://nptel.ac.in/courses/112103108/ - Engineering Mechanics - Prof. U. S. Dixit- Indian Institute of Technology, Guwahati
6.https://nptel.ac.in/courses/112106180/ - Statics and Dynamics- Dr.Mahesh V. Panchagnula, Indian Institute of Technology, Madras

Course Contents and Lecture Schedule

Module No.	Topics	No of Periods
1	**Statics of Particles and Rigid bodies**	
1.1	Fundamental principles and concepts	1
1.2	Laws of Mechanics Principle of Transmissibility – Parallelogram, Triangle and Polygon law of forces	1
1.3	Resultant of concurrent and non-concurrent	1
1.4	Conditions of Static Equilibrium	1
1.5	Lami's theorem	1
1.6	Free body diagram - Reactions	1
1.7	Moment of a force & Varignon's theorem	1
1.8	Force couple system Reduction of system of forces into one force and couple	2
1.9	Equilibrium of rigid bodies in 2D	1
2	**Friction**	
2.1	Role of frictional force – Types of friction – Limiting friction – Coefficient of friction and angle of friction	1
2.2	Coulomb's law of friction	1
2.3	Angle of repose and wedge friction	1
2.4	Belt friction	1
3	**Centroid, Centre of Gravity and Moment of Inertia**	
3.1	Centroid of simple and composite plane figures	1
3.2	Centre of gravity of a simple and composite solid	1
3.3	Pappus and Guldinus theorem	1
3.4	Area Moment of Inertia and Parallel and Perpendicular Axis Theorems	1
3.5	Polar Moment of Inertia – Radius of gyration	1
3.6	Mass Moment of Inertia – Simple and Composite plane figures and solid bodies;	1
4	**Kinematics of Particles**	
4.1	Rectilinear motion-Uniform and Variable acceleration – Motion of particle under gravity – Relative motion	2
4.2	Curvilinear motion	1
5.	**Kinetics of Particles**	
5.1	Newton's Second Law of Motion – D'Alembert's Principle. Work energy principle	1
5.2	Conservation of Energy	1
5.3	Work Energy Principle	1
5.4	Impulse Momentum Principle	1

5.5	Conservation of linear momentum – Motion of singular body and connected bodies.	2
6.	**Kinematics and Kinetics of Rigid Bodies**	
6.1	Relationship between angular motion and linear motion	2
6.2	Uniformly accelerated rotation	1
6.3	Kinematics of General Plane Motion	1
6.4	Instantaneous Axis of Rotation	1
6.5	Kinetics of rolling bodies	1
6.6	Kinetics of General Plane Motion	1
	Total Periods	36

Course Designer(s):

S.No.	Name	Designation	Department	Email id
1.	Dr. V. Balasubramani	Associate Professor	Mechanical Engineering	vbmech@tce.edu
2.	Dr. C. Vignesh	Assistant Professor	Mechanical Engineering	cvmech@tce.edu

26EGHA0	TECHNICAL ENGLISH	CATEGORY	L	T	P	CREDITS	TE TYPE
		HSMC	2	0	2	3	TCP-T

1. Preamble

Technical English is a course that develops essential communication skills for academic and engineering professional contexts. The course integrates listening, speaking, reading, and writing through practical technical and workplace-based activities.

2. Prerequisite

Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Interpret technical texts, engineering manuals, and academic articles, extracting key information and inferring meaning from the context.	TPS3	9.1.1	20%	4	1
CO2	Use context-appropriate vocabulary and grammatical accuracy in technical writing including reports, Instructions, and graphical Interpretation.	TPS3	9.1.2	20%	4	1
CO3	Draft agendas, notices, and minutes of meetings in accordance with standard organizational formats and communication protocols.	TPS3	9.1.3	20%	5	1
CO4	Design effective technical presentation slides using visual clarity, proper formatting, and appropriate data representation techniques.	TPS3	9.2.2	20%	4	1
CO5	Apply professional and ethical communication practices in social media and workplace digital communication using proper netiquette and sentence construction.	TPS3	9.3.2	20%	11	1

4. Assessment Pattern

CO	Assessment 1						Assessment 2			Terminal (%)		
	Written Test 1 (%)			Assignment 1 (%)			Lab Activities					
TPS	1	2	3	1	2	3	1	2	3	1	2	3
CO1	-	-	20%	-			-	-	20%	-	-	20%
CO2	-	-	20%	50%			-	-	20%	-	-	20%
CO3	-	-	20%	-			-	-	20%	-	-	20%
CO4	-	-	20%	-			-	-	20%	-	-	20%
CO5	-	-	20%	50%			-	-	20%	-	-	20%
TOTAL	100%			100%					100%	100%		

5. Syllabus

Module1

Technical Reading and Vocabulary Development

Technical Reading Strategies – Skimming, Scanning, Intensive and Extensive Reading – Manuals - Academic Articles — Technical Word Families – Prefixes and Suffixes in Engineering Terminology – Collocations in Engineering Discourse – Inferring meaning from Context- Note-making, Summarising and Paraphrasing Technical Content.

Lab Activity: Listening files and Note-taking& Reading- based note making

Module 2

Editing, Analytical Reading and Ethical AI Communication Skills

Analytical Reading and Error Identification – Sentence clarity, cohesion and transition signals – Ethical use of AI in Writing and Communication – AI-assisted Editing and Summarising – Interpreting Charts, Graphs and Diagrams.

Lab Activity: Reading-based Editing Exercises – Picture/Chart Description Activity.

Module 3

Professional and Technical Workplace Communication

Formal Letters – Permission- Bona fide - Business Letters – Formats – Letters of Inquiry, Complaint, and Recommendation – Minutes of Meetings and Notices – Agenda preparation – Recording and Circulating Minutes – Action Items and Follow-up Communication.

Lab Activity: Listening to Audio files and Preparing Minutes

Module 4

Oral Communication and Interpersonal Skills

Question Forms and Question Tags- Spotting Errors- Types of Sentences- Oral Presentation Skills – Planning and Structuring a Technical Presentation – Designing effective Slides (visual clarity, data display) – Verbal and Non-verbal Communication – Handling Q&A Sessions.

Lab Activity: Digital Presentation, Spotting Errors

Module 5

Career Communication and Digital Professionalism

Social Media and Workplace Digital Communication – Professional Use of Platforms – etiquette – Data Privacy and Ethical Communication Practices – Environmental and SDG-aligned Communication- Jumbled Sentences.

Lab Activity: Presentation on SDG topics, Jumbled Sentences

6. Learning Resources

6.1 Text Book

1. **Sanjay Kumar and Pushplata,** "Communication Skills", 3rd Edition, Oxford University Press, 2021.
2. **M. Ashraf Rizvi,** "Effective Technical Communication", 2nd Edition, McGraw-Hill Education India, 2018.
3. **John M. Lannon and Laura J. Gurak,** "Technical Communication", 15th Edition, Pearson Education, 2020.

Department of English, Technical English Work Book, 1st Edition, New Century Book House (P) Ltd., Chennai.

6.2 Reference Books & Web resources

- Michael Markel and Stuart A. Selber, "Technical Communication", 12th Edition, Bedford/St. Martin's, 2018.
- Sharon J. Gerson and Steven M. Gerson, "Technical Writing: Process and Product", 8th Edition, Pearson, 2017.
- Adrian Wall work, "English for Writing Research Papers", 2nd Edition, Springer, 2016.
- AICTE Examination Reform Policy, November 2018 – https://www.aicte-india.org
- MIT Open Courseware – Technical Writing (21W.035): https://ocw.mit.edu
- NPTEL – Communication Skills (IIT Kharagpur): https://nptel.ac.in

7. Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1.	Technical Word Families, Prefixes/Suffixes	1
2.	Manuals and Academic Articles	1
3.	Collocations & Contextual Meanings	1
4.	Note-making, Summarising & Paraphrasing Technical Content	1
5.	Note-taking & Reading-based Note-making	1
6.	Analytical Reading and Error Identification	1
7.	Sentence Clarity, Cohesion and Transition Signals	1
8.	Ethical Use of AI in Writing and Communication	1
9.	AI-assisted Editing and Summarising	1
10.	Interpreting Charts, Graphs and Diagrams	1
11.	Reading-based Editing Exercises & Picture/Chart Description	1
12.	Formal Letters – Permission – Bona fide – Business Letter Formats	1
13.	Letters of Inquiry, Complaint and Recommendation	1
14.	Minutes of Meetings and Notices	1
15.	Agenda Preparation – Recording, Circulating Minutes & Follow-up Communication	1
16.	Preparing Minutes	1
17.	Question Forms, Question Tags, Spotting Errors & Types of Sentences	1
18.	Oral Presentation Skills – Planning and Structuring Technical Presentation	1
19.	Designing Effective Slides, Verbal & Non-verbal Communication, Handling Q&A	1

20.	Spotting Errors	1
21.	Social Media and Workplace Digital Communication	1
22.	Professional Use of Platforms, Netiquette & Data Privacy	1
23.	Environmental and SDG-aligned Communication & Ethical Practices	1
24.	Professional Use of Platforms & etiquette	1
Total		**24**

8. Course Contents and Lab Schedule: 16 hours

1.	Listening-based Note-taking Exercises	2
2.	Reading-based Editing Exercises and Picture/Chart Description Activity.	2
3.	Preparing Minutes from Audio Files	2
4.	Jumbled sentence activities Exercises	2
5.	Presentation on SDG Topics	2
6.	Technical Presentation Practice	2
7.	Digital Presentation	2
8.	Model Exam	2
Total		**16**

9. Lab Assessment

S.No	Assessment Activity	Skills Assessed	Percentage (%)
1.	Listening to Technical Audio (CO1 – 20 marks)	Listening comprehension and acquisition of technical vocabulary	20%
2.	Spotting Errors (CO4 – 10 marks) and Reading Comprehension (CO5 - 20 marks)	Grammatical correctness, coherence, sentence organization and context understanding	30%
3.	Picture Description (CO2 – 20 marks)	Vocabulary, technical description and fluency	20%
4.	Minutes and Digital Presentation (CO3 – 20 marks, CO4 – 10 marks)	Communication skill, confidence and response to questions	30%

The course includes End Semester Theory Examination.

10. Course Designer(s):

1. Dr.S.Subash Assistant Professor, Department of English | ssheng@tce.edu
2. Dr.M.Arjunan, Assistant Professor, Department of English | maeng@tce.edu

26EGAA0	BASIC ENGLISH

Category	L	T	P	Credit
AC	2	0	0	0

1. Preamble

This course develops foundational English language skills in grammar, vocabulary, listening, speaking, reading, and writing. It enhances learners' confidence in using English effectively through interactive communication and language practice activities.

2. Prerequisite

NIL

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain the fundamentals of English grammar and language usage through Peer Practice	TPS2	9.1.1	20%	NC	0
CO2	Apply appropriate vocabulary, functional expressions, and sentence construction techniques in communication	TPS3	9.1.3	20%	SDG 4	1
CO3	Demonstrate effective listening and oral communication skills in academic, professional, and social contexts	TPS3	9.2.1	30%	SDG 4	2
CO4	Apply reading and writing skills through comprehension, summarizing and paragraph writing activities.	TPS3	9.1.2	30%	SDG 4	1

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2 (lab) (Activities)	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	50	100			20
CO2	40				20
CO3			50	100	30
CO4	10		50		30
Total	100	100	100	100	100

***CAT2 – lab Activities**

Listening - CO3 (Listening to News, Reports, Short Stories or Interviews) followed by comprehension activities
Speaking - CO3 (Pair Activities, Story Narration, Describing People, Places and Objects)
Reading - CO4 (Reading Comprehension Passages with inference and vocabulary based questions)
Writing - CO4 (Paragraph Writing based on familiar and contextual topics)

Assignment 1:CO1 &CO2 (Grammar and Vocabulary Exercises focusing on language usage & sentence construction)

Assignment 2 CO3 & CO4(Integrated Listening ,Speaking , Reading and Writing activities to develop communication skills)

5. Syllabus

Module 1: English for Peer Practice (CO1)

Identifying parts of speech through reading &word-classification activities – expressing ideas: situational conversations – developing language accuracy: editing and peer-learning activities – narrating daily experiences (past events, and Plans through speaking and writing exercises).

Module 2: Vocabulary and Functional English (CO2)

Spelling- Synonyms and Antonyms –Contextual Vocabulary- Functional Expressions for Formal and Informal Communication

Module 3: Listening and Speaking Skills (CO3)

Listening to (Stories and Interview)- Introducing oneself and others-Role Play -Oral Communication activities on SDG topics (storytelling, Describing People, places and objects)

Module 4: Reading and Writing Skills (CO4)

Reading Aloud (Stories and Newspaper articles) - Reading for Pleasure (Ruskin Bond - *Great stories for Children*) -Reading Comprehension-Hints Development -Discourse Markers- Punctuation- Paragraph Writing

Learning Resources

6. Reference Books & Web resources

Elbow, Peter. *Writing With Power: Techniques for Mastering the Writing Process*. Oxford University Press, 1998.

Ruskin Bond, Great stories for Children, Rupa Publications India Pvt. Ltd.1 January2011

Wood, Frederick T. A Remedial English Grammar for Foreign Students. Trinity Press, 2022.

Swan, Michael. Practical English Usage. 4th ed., Oxford University Press, 2016.

Murphy, Raymond. Essential English Grammar. Cambridge University Press, 2024.

Redman, Stuart. English Vocabulary in Use: Pre-Intermediate and Intermediate. 4th ed., Cambridge University Press, 2017.

Web sources

https://learnenglish.britishcouncil.org/

https://www.bbc.co.uk/learningenglish/

iSLcollective.com

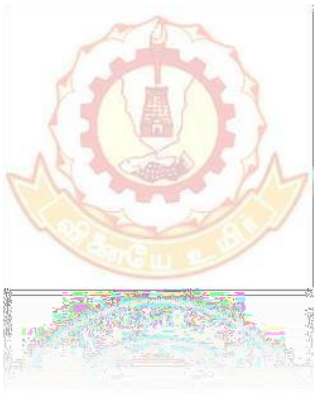
7. 7. Course Contents and Lecture Schedule

Module No	Topics	No. of Periods
Module 1	Introduction to the course	1
	Parts of Speech	1
	Situational conversations	1
	Editing and peer-learning activities	1
	Narrating daily experiences	1
Module 2	Spelling	1
	Synonyms and Antonyms	1
	Contextual Vocabulary	1
	Functional Expressions for Formal and Informal Communication	1
Module 3	Listening Activities (Stories and Interview)	1
	Introducing Oneself and Others	2
	Role Play activities	2
	Oral Communication Activities on SDG topics	2
Module 4	Reading Aloud (Stories and Newspaper Articles)	1
	Reading for Pleasure	1

	Reading Comprehension	1
	Hints Development	1
	Discourse Markers	1
	Punctuation	1
	Paragraph Writing	2
	Total Periods	**24**

8. 8.Course Designer(s):

Dr. A. Tamilselvi, Professor, English,	tamilselvi@tce.edu
Dr. G. Jeya Jeevakani, Assistant Professor, English,	gjjeng@tce.edu
Dr. T. Arul Prakash, Assistant Professor ,English,	tapeng@tce.edu



26MEEA0	ENGINEERING GRAPHICS	Category	L	T	P	Credit	TE Type
		ESC	1	-	4	3	TCP-P

(Common to Mechanical Engg, Civil Engg, Electrical Electronics Engg., Fashion technology)

Preamble

Engineering Graphics is referred as language of engineers. An engineer needs to understand the geometry of any object through its orthographic or pictorial projections. The knowledge on engineering graphics is essential in proposing new product designs through drawings and in reading or understanding the existing drawings.

Prerequisite

- Nil

Course Outcomes

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

No.	Course Outcome	TCE Proficiency Scale	Performance Indicator	CO Weightage	SDG Addressed	SDG Level
CO1	Draw the orthographic views of objects from the given isometric views	TPS3	1.4.1	14%	SDG 9: Industry, Innovation, & Infrastructure	Level 1 (Introductory)
CO2	Draw the orthographic projections of straight lines inclined to both reference planes.	TPS3	1.4.1	14%	SDG 9: Industry, Innovation, & Infrastructure	Level 1 (Introductory)
CO3	Draw the orthographic projections of plane surfaces inclined to one reference planes.	TPS3	1.4.1	14%	SDG 9: Industry, Innovation, & Infrastructure	Level 1 (Introductory)
CO4	Draw the orthographic projections regular solids with axis inclined to any one-reference plane.	TPS3	1.4.2	14%	SDG 9: Industry, Innovation, & Infrastructure	Level 2 (Intermediate)
CO5	Draw the orthographic projection and its development of sectioned solids and true shape of the sections.	TPS3	1.4.2	14%	SDG 9: Industry, Innovation, & Infrastructure	Level 2 (Intermediate)
CO6	Develop computer-aided 2D models for the given drawing with appropriate dimensioning using CAD package (Continuous Assessment only).	TPS3	5.1.1	15%	SDG 4: Quality Education SDG 9: Industry, Innovation, & Infrastructure	Level 2 (Intermediate)
CO7	Develop computer-aided 3D models for the given drawing with appropriate dimensioning using CAD package (Continuous Assessment only).	TPS3	5.2.1	15%	SDG 4: Quality Education SDG 9: Industry, Innovation, & Infrastructure	Level 2 (Intermediate)

Assessment Pattern

CO	Practical	Theory	Terminal Exam*
	OCR/Continuous Assessment	Model Test CO-wise	
	% of Marks	% of Marks	% of Marks
CO1	14	15	15
CO2	14	15	15
CO3	14	20	20
CO4	14	25	25
CO5	14	25	25
CO6	15	-	
CO7	15	-	
Total	100	100	100

***Note:** **Terminal Practical Examination will be conducted by Mechanical Department and will be evaluated by two internal examiners. Duration of the examination is 3 hours.**

Assessment Pattern: Practical Component

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-lab, In-lab, Post-lab	75	Conducted throughout the semester
Model Test	CO-wise(Cognitive, Psychomotor, Affective)	25	Rubrics covering all Domains of learning
Total Internal Marks		**100**	
End Semester Examination	CO-wise(Cognitive, Psychomotor, Affective)	100	Rubrics covering all Domains of learning

Syllabus

Module 1: Principle of Orthographic Projection
Drawing instruments, Drawing standards (BIS), Lettering in engineering, Sheet layout, elements of dimensioning, Systems of dimensioning-Orthographic Projection – Principles of first angle projection – Conversion of isometric views to orthographic views – Selection of front view – Top view and side views – Conventional representation of standard features.

Module 2: Projections of Straight Lines
Projections of Lines – Line inclined to one plane and parallel to the other – Line inclined to both the reference planes (HP and VP) – True length and true inclinations of a line – Rotating line method.

Module 3: Projections of Plane Surfaces
Projections of Planes – Surface inclination to one reference plane – Projection of regular polygonal planes (triangle, square, rectangle, pentagon, hexagon) – Projection of circular planes.

Module 4: Projections of Regular Solids
Projections of Solids – Classification of solids (prisms, pyramids, cylinders, cones) – Axis inclined to one reference plane and parallel to the other – Axis inclined to one reference plane and perpendicular to the other – Turning/change of position method.

Module 5: Section of Solids and Development of Surfaces
Sectioned Solids & Surface Development – Section planes perpendicular to one plane and inclined to another – True shape of a section – Development of lateral surfaces of regular and sectioned solids – Parallel line development – Radial line development.

Module 6: Computer-Aided 2D Drafting
Introduction to CAD Package – 2D Commands and interface. Orthographic & Isometric Projection: Introduction. Setting up Units, Limits, and basic Layers (Object, Hidden, Dimension). Coordinate entry systems: Absolute and Relative Polar. Core Drawing Commands: LINE, CIRCLE, RECTANG, POLYGON. Essential Modify Commands: MOVE, COPY, ROTATE, TRIM, MIRROR, FILLET. Functional Annotation: Basic Linear and Radius dimensioning.

Module 7: Computer-Aided 3D Modelling
Introduction to CAD Package – 3D Commands and interface. 3D Navigation: Workspace switching, User Coordinate System (UCS), ViewCube, and Visual Styles. Solid Primitives: BOX, CYLINDER. Creating 3D Solids from 2D profiles: EXTRUDE, PRESSPULL. Boolean Operations: UNION, SUBTRACT. Model Layout:Preparing standard drawing sheets to display finished solid components.

Text Book

1. N. D. Bhatt, “Engineering Drawing”, Charotar Publishing house Pvt. Ltd, Anand, 2025.

Reference Books & web resources

1. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2012.
2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2019.
3. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2011.
4. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Publications, Bangalore, 2017.
5. Shah M.B, and Rana B.C (2009) “Engineering Drawing and Computer Graphics”, Pearson Education.
6. CAD Software Theory and User Manuals.

SDG Alignment

Activities aligned with SDGs addressed:

1. **SDG 9: Industry, Innovation, and Infrastructure**
   Training students in industry-standard 2D drafting and 3D modelling tools (like AutoCAD) to develop technical skills required for modern engineering design, digital manufacturing, and infrastructural innovation.
2. **SDG 4: Quality Education**
   Providing relevant technical and vocational skills for employment, decent jobs, and entrepreneurship by equipping students with advanced computer-aided design capabilities aligned with global engineering standards.

Course Contents and Lecture Schedule

Module No	Topics	No of Periods		Course outcomes
		Lecture	Practice	
1	**Principle of Orthographic Projection**	**1**	**5**	
1.1	Principles of Orthographic Projection & First Angle Projection conventions	1	1	CO1
1.2	Selection of front view, top view, and side views for components		1	CO1
1.3	Conversion of Isometric views to Orthographic views		2	CO1
1.4	Conventional representation of standard features		1	CO1
2	**Projections of Straight Lines**	**1**	**9**	
2.1	Introduction to Projections of Lines: Parallel to one or both planes	0.5	1	CO2
2.2	Line inclined to one reference plane and parallel to the other (HP and VP problems)		2	CO2
2.3	Line inclined to both reference planes (HP and VP) – Introduction to apparent lengths	0.5	2	CO2
2.4	Finding True Length (TL) and True Inclinations using the Rotating Line Method		2	CO2
2.5	Advanced practice problems on lines inclined to both planes		2	CO2
3	**Projections of Plane Surfaces**	**2**	**9**	
3.1	Introduction to Projections of Planes & Surface inclination to one reference plane	0.5	2	CO3
3.2	Projection of regular polygonal planes: Triangle and Square	0.5	2	CO3
3.3	Projection of regular polygonal planes: Rectangle and Pentagon	0	2	CO3
3.4	Projection of Hexagonal planes with different orientation conditions	0	2	CO3
3.5	Projection of Circular planes (inclined to HP/VP)	1	1	CO3
4	**Projections of Regular Solids**	**2**	**8**	
4.1	Classification of regular solids (Prisms, Pyramids, Cylinders, Cones) & basic projections	0.5	2	CO4
4.2	Solids with axis inclined to one reference plane and parallel to the other	0.5	2	CO4
4.3	Solids with axis inclined to one reference plane and perpendicular to the other	0	2	CO4
4.4	Solving solids projection using the Turning / Change of Position Method	1	2	CO4
5	**Section of Solids and Development of Surfaces**	**2**	**9**	
5.1	Introduction to Section of Solids: Section planes perpendicular to one plane and inclined to another	0.5	1	CO5
5.2	Determining and drawing the True Shape of a section (Prisms/Pyramids)	0.5	2	CO5
5.3	Concept of Development of Lateral Surfaces & Parallel Line Development (Prisms & Cylinders)	0.5	2	CO5
5.4	Radial Line Development method for Pyramids and Cones	0.5	2	CO5
5.5	Development of lateral surfaces of sectioned/cut solids		2	CO5
6	**Computer-Aided 2D Drafting**	**2**	**4**	

7	Volumetric Editing and Final Model Layout Sheet Setup	Level 2	**Design, Communication:** Test engineering systems using iterative design validation; communicate final experimental findings effectively via professional written/graphical sheet layouts.	CO7

Course Designer(s):

S. No.	Name	Designation	Department	Email id
1.	Dr. B. Karthikeyan	Assistant Professor	Mechanical Engineering	bkmech@tce.edu
2.	Dr. M. Balamurali	Associate Professor	Mechanical Engineering	balacim82@tce.edu
3.	Mr. T. Prakash	Assistant Professor	Mechanical Engineering	tpmech@tce.edu
4.	Dr. C. Selva Kumar	Assistant Professor	Mechanical Engineering	cskmech@tce.edu
5.	Dr. R. Kamalakannan	Assistant Professor	Mechanical Engineering	rkkmech@tce.edu

6.1	Introduction to CAD Package – 2D Commands and interface. Orthographic & Isometric Projection: Introduction.	1	1	CO6
6.2	Setting up Units, Limits, and basic Layers (Object, Hidden, Dimension). Coordinate entry systems: Absolute and Relative Polar.		1	CO6
6.3	Core Drawing Commands: LINE, CIRCLE, RECTANG, POLYGON.	1	1	CO6
6.4	Essential Modify Commands: MOVE, COPY, ROTATE, TRIM, MIRROR, FILLET. Functional Annotation: Basic Linear and Radius dimensioning.		1	CO6
7	**Computer-Aided 3D Modelling**	**2**	**4**	
7.1	Introduction to CAD Package – 3D Commands and interface. 3D Navigation: Workspace switching, User Coordinate System (UCS), View Cube, and Visual Styles.	1	1	CO7
7.2	Solid Primitives: BOX, CYLINDER.		1	CO7
7.3	Creating 3D Solids from 2D profiles: EXTRUDE, PRESSPULL.	1	1	CO7
7.4	Boolean Operations: UNION, SUBTRACT. Model Layout: Preparing standard drawing sheets to display finished solid components.		1	CO7
	Total Periods	**12**	**48**	

List of Exercises with CO Mapping

Sl. No.	Name of the Exercise	Level of Exercise	Objective(s)	COs Addressed
1	Introduction to CAD Environment and Coordinate Systems	Level 1	**Psychomotor Skills:** Demonstrate procedural proficiency in operating CAD software interfaces and navigating coordinate systems.	C06
2	Workspace Setting and Drawing Initialization	Level 2	**Psychomotor Skills, Models:** Demonstrate manual dexterity in configuring software workspaces and connecting theoretical layout standards to digital environments.	C06
3	2D Geometric Profile Construction	Level 2	**Design, Psychomotor Skills:** Design and construct systematic 2D geometric shapes with precise dimensional controls and documentation.	C06
4	Modification and Functional Annotation of 2D Layouts	Level 2	**Design, Communication:** Apply modification tools to 2D engineering systems and communicate experimental design findings through precise professional annotations.	C06
5	Navigation and Modeling of Solid Primitives in 3D Space	Level 1	**Psychomotor Skills:** Demonstrate manual dexterity and procedural proficiency in operating 3D workspace tools and generating basic solid primitives.	C07
6	Generative 3D Modeling from 2D Profiles	Level 2	**Models, Design:** Connect theoretical 2D profile models to real-world 3D experimental behavior; design and build complex engineering parts.	C07

26MECB0	WORKSHOP	Category	L	T	P	Credits	T E type
		PCC	0	0	2	1	Practical

Preamble

The Engineering Fundamentals Workshop course delivers foundational, hands-on training to bridge theoretical science and practical manufacturing techniques. It trains students to safely identify, select, and manage the industrial tools, materials, and processes required to execute engineering projects. Working in a collaborative team environment, students develop critical skills in planning, physical measurement, fabrication, and quality inspection. This experiential foundation prepares students for advanced engineering design, industrial internships, and multidisciplinary product development with the following objectives:

- Master in Workshop Safety: Implement the accident prevention rules, emergency protocols, and personal protective equipment (PPE) guidelines.
- Identify Engineering Materials: Differentiate structural applications of ferrous metals, non-ferrous alloys, polymers, and timber.
- Utilize Precision Instruments: Operate vernier calipers, micrometers, and gauges to check structural accuracy.
- Execute Fabrication Processes: Perform basic operations across carpentry, fitting, welding, machining, and sheet metal working.

Prerequisite

NIL

Course Outcomes

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

CO	CO statement	TPS Level	PI	Objective	SDG Addressed	SDG Level
CO1	Mitigate operational hazards and validate component dimensions using precision instruments	TPS 3	1.2.1	10	3	1
CO2	Produce precise mechanical assembly parts manually	TPS 3	1.2.1	6	9	1
CO3	Perform sheet metal operations and resistive spot welding to fabricate sheet metal products	TPS 3	1.4.1	6	12	1
CO4	Perform basic subtractive machining on stock material using general purpose lathe	TPS 3	1.4.1	6	9	1
CO5	Diagnose and rebuild mechanical systems to factory specifications	TPS 3	1.4.1	8	9	1
CO6	Demonstrate functional, electrical circuit.	TPS 2	1.2.1	3	7	1

Contents:

1. Safety & Metrology: Tool handling, hazard analysis, precision measurement
2. Carpentry &its Fitting: Timber joints, sawing, planning, filing, chipping
3. Sheet metal fabrication and spot welding: Different sheet metal operation and spot welding
4. Basic Machining: Lathe operations like plain and step turning, drilling etc.
5. Assembly & Dismantling: Gearbox strip-down, bearing replacement etc.
6. Basic Electrical wiring: House wiring layouts and circuit testing

Assessment Pattern: Cognitive Domain

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-lab, In-lab, Post-lab	75	Conducted throughout the semester
Model Test	CO-wise (Cognitive, Psychomotor, Affective)	25	Mid/End semester internal test
Total Internal Marks		**100**	
End Semester Examination	CO-wise (Cognitive, Psychomotor, Affective)	100	-

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	COs Addressed
1.	• Selection of Personal Protective Equipment (PPE) for specific work shop zones • Perform a physical walk through the workshop to log and map potential safety risks • Measurement of internal & external diameter and depth steps of a machined part using vernier caliper	0	CO1
2.	• Fabrication of different Joints and perform the assembly	0	CO2
3.	• Fabrication of sheet metal product as per the drawing	0	CO3
4.	• Machining (turning/facing) of part as per the given drawing using general purpose lathe	0	CO4
5.	• Diagonise and rebuilding of simple mechanical sub-systems to factory specifications	0	CO5
6.	• Demonstrate the electrical circuit for a given simple application	0	CO6

Course Designer(s):

S.No.	Name	Designation	Department	Email id
1.	Dr. C. Paramasivam	Professor (CAS)	Mechanical Engineering	cpmech@tce.edu
2.	Dr. ML. Mahadevan	Asso. Prof. (CAS)	Mechanical Engineering	mlmmech@tce.edu

26PHSB0	Physics Laboratory (Common to all branches)	Category	L	T	P	Credits
		BSC	0	0	3	1.5

Preamble

Physics Laboratory enables first-year engineering students to experimentally explore the concepts taught in the co-requisite theory course (26PHSA0) through carefully designed experiments in core areas of physics. The course develops practical skills in instrumentation, data analysis, model validation, teamwork, safety, and ethical scientific reporting. It also supports Sustainable Development Goals related to quality education, clean energy, innovation, and sustainable development.

Prerequisite

- Engineering Physics (26PHSA0) co-requisite
- Physics at the Higher Secondary (Class XII) level

Course Outcomes

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

COs	Course Outcome Statement	TCE Proficiency Scale	Performance Indicators	Objective	SDG Addressed	SDG Level
CO1	Operate laboratory instruments, including photo detectors, solar cell setups, and logic trainers, to measure physical quantities related to core physics experiments.	TPS 3	5.2.1	1	NC	-
CO2	Analyse deviations between theoretical predictions and experimental results in mechanics, electrodynamics, and quantum physics experiments.	TPS 4	2.3.1	2	NC	-
CO3	Evaluate experimental procedures for adequacy of controls, documentation standards, and reproducibility.	TPS 5	4.2.1	3	NC	-
CO4	Examine experimental data using statistical methods to quantify uncertainty and draw valid conclusions.	TPS 3	4.3.1	4	NC	-
CO5	Demonstrate practical skills in setting up and handling optical, mechanical, and electronic experimental systems.	TPS 3	5.2.1	6	NC	-
CO6	Prepare structured laboratory reports that present experimental methods, results, and conclusions in a professional manner, with due regard for ethical standards.	TPS 3	9.1.2	13	NC	-

Assessment Pattern: Cognitive Domain

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-lab, In-lab, Post-lab	75	Conducted throughout the semester
Model Test	CO-wise (Cognitive, Psychomotor, Affective)	25	Mid/End semester internal test
Total Internal Marks		**100**	
End Semester Examination	CO-wise (Cognitive, Psychomotor, Affective)	100	As directed by COE or as per the curriculum

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Determine the acceleration due to gravity (g) and the radius of gyration of a compound pendulum by studying its time period of oscillation.	1	1,2,3,4,13	CO1, CO2, CO3, CO4, CO6
2	Determine the resonant frequency, quality factor (Q), and bandwidth of an LCR series circuit by measuring the frequency response of current amplitude.	1	1,2,3,4,13	CO1, CO2, CO3, CO4, CO6
3	Determine the energy band gap (E_g) of a semiconductor material (Germanium or Silicon) by studying the variation of reverse saturation current with temperature.	1	1,2,3,4,13	CO1, CO2, CO3, CO4, CO6
4	Determine Planck's constant (h) using LEDs of different known wavelengths by measuring the threshold (knee) voltage for light emission.	1	1,2,3,4,6	CO1, CO2, CO3, CO4, CO5
5	Determine the frequency of AC supply using a sonometer and verify the laws of transverse vibrations of stretched strings.	1	1,2,3,4,6	CO1, CO2, CO3, CO4, CO5
6	Realise the Toffoli gate (CCNOT) using standard NAND, AND, and XOR logic gates, and verify its	2	1,3,13	CO1, CO3, CO6

	truth table, demonstrating reversibility and universality.			
7	Study the I-V characteristics of a silicon solar cell under illumination and determine it short-circuit current (Isc), open-circuit voltage (Voc), fill factor (FF), and photoelectric conversion efficiency (η).	1	1,2,3,4,13	CO1, CO2, CO3, CO4, CO6
8	Determine the magnetic field along the axis of a current-carrying circular coil and verify the Biot–Savart law.	1	1,2,3,4,13	CO1, CO2, CO3, CO4, CO6

Course Designer(s):

Dr. M. Mahendran manickam-mahendran@tce.edu
Dr. M. Tamilelakkiya mtphy@tce.edu
Dr. S. Karthickprabhu skphy@tce.edu

26CCEA0	INTRODUCTION TO ENGINEERING	Category	L	T	P	Credits	TE type
		ESC	1	0	2	2	TCP-P

1. Preamble

This course introduces first-year engineering students to the engineering profession, fundamental measurement techniques, and the design of simple functional systems. Through hands-on activities such as product teardown, instrument-based measurements, 3D modelling using TinkerCAD, data analysis with Excel, and team-based projects, students develop essential technical and professional skills. The course follows the CDIO (Conceive–Design–Implement–Operate) framework, fostering engineering thinking from the first semester. It also promotes awareness of engineering ethics, safety, sustainability, and the role of engineering in addressing societal challenges and the UN Sustainable Development Goals.

2. Prerequisite

Nil

3. Course Outcomes

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

No.	Course Outcome	TCE Proficiency Scale	Performance Indicator	CO Weightage	SDG Addressed	SDG Level
CO1	Describe the engineering profession, major engineering disciplines, and the CDIO framework for product and system lifecycle.	TPS 2	1.1.1	15%	SDG 4	1
CO2	Decompose a product or engineering system into its functional components, sub-systems, and operational constraints using structured analysis.	TPS 3	1.2.1	20%	SDG 9	2
CO3	Apply data acquisition systems and computational tools (Excel / Python) to acquire, process, and interpret sensor data with appropriate uncertainty analysis.	TPS 3	5.2.1	20%	SDG 9	2
CO4	Implement and validate a simple engineering artefact/system by applying basic	TPS 3	4.4.1	20%	SDG 9	2

	engineering principles, tools, and teamwork.					
CO5	Demonstrate professional teamwork and technical communication competencies through a structured engineering report and oral presentation.	TPS 3	8.2.1	15%	SDG 4	2
CO6	Evaluate engineering solutions against criteria of professional ethics, occupational safety, and sustainable development, with reference to relevant SDGs.	TPS 4	7.2.1	10%	SDG 12, SDG 13	3

4. Assessment Pattern

CO	Theory		Practical		Terminal Exam (Practical)
	CAT1	CAT2	OCR/Continuous Assessment	Model Test CO-wise	
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1		**25**	**100**	**100**	100
CO2		**35**			
CO3		**30**			
CO4		**10**			
CO5					
CO6					
Total	-	100	100	100	100

5. Assessment Pattern: Practical Component

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-lab, In-lab, Post-lab	75	Conducted throughout the semester
Model Test	CO-wise (Cognitive, Psychomotor, Affective)	25	Rubrics covering all Domains of learning
Total Internal Marks		**100**	
End Semester Examination	CO-wise (Cognitive, Psychomotor, Affective)	100	Rubrics covering all Domains of learning

6. Syllabus

Module 1: Engineering Around Us

What is engineering? – Major engineering disciplines – Engineering in everyday life – Engineering and society – Creativity and innovation – Engineering products and systems – Product observation and teardown activity.

Module 2: Engineering Measurements and Tools

SI units and engineering measurements – Measurement of dimensions and physical quantities using basic measuring instruments – Data recording – Accuracy, precision, and errors – Engineering estimation and reasoning – Safe use of engineering tools and instruments.

Module 3: Engineering Visualization and Simulation

Introduction to engineering drawings and visualization – Basic 2D and 3D concepts – Excel for tables and graph plotting – Introduction to ThinkerCAD – Simple 3D object creation – Basic circuit simulation.

Module 4: Engineering Making

Introduction to engineering materials – Basic fabrication techniques: cutting, joining, and assembling – Workshop safety practices – Introduction to sensors and automation concepts – Team-based engineering activity – Building a simple functional model.

Module 5: Teamwork, Ethics and Sustainability

Teamwork and collaboration – Basics of technical presentations – Engineering ethics and responsibilities – Engineering safety – Sustainability and SDGs in engineering – Engineering solutions for society.

7. Learning Resources

7.1 Text Books

1. Crawley, E., Malmqvist, J., Ostlund, S., Brodeur, D., "Rethinking Engineering Education: The CDIO Approach", Springer, 2014.
2. Eide, A., Jenison, R., Mashaw, L., Northup, L., "Introduction to Engineering Design and Problem Solving", McGraw-Hill, 3rd Edition.

7.2 Reference Books & Web Resources

1. CDIO Syllabus v3.0, Worldwide CDIO Initiative -- www.cdio.org (free download).
2. MIT Open Course Ware 2.00A: Introduction to Design -- ocw.mit.edu.
3. Python for Engineers: Google Colab notebooks (free, requires internet).
4. IEEE Engineering Ethics Resources -- www.ieee.org/ethics.

8. Course Contents and Lecture Schedule

Module No	Topics	No of Periods	**Course Outcomes**
Module 1:			
1.1	What is engineering? – Major engineering disciplines – Engineering in everyday life	2	CO1
1.2	Engineering and society – Creativity and innovation	1	CO1
1.3	Engineering products and systems – Product observation and teardown activity	1	CO1, CO2
2.1	SI units and engineering measurements – Measurement of physical quantities using basic instruments	1	CO3
2.2	Data recording – Accuracy, precision, and errors – Engineering estimation and reasoning	1	CO3

2.3	Safe use of engineering tools and instruments	1	CO3, CO6
3.1	Introduction to engineering drawings and visualization – Basic 2D and 3D concepts	1	CO2
3.2	Excel for tables and graph plotting – TinkerCAD: 3D object creation and basic circuit simulation	1	CO2, CO3
4.1	Introduction to engineering materials – Fabrication techniques: cutting, joining, assembling – Workshop safety	1	CO4, CO6
4.2	Sensors and automation concepts – Team-based engineering activity – Building a simple functional model	2	CO4
5.1	Teamwork and collaboration – Basics of technical presentations	1	CO5
5.2	Engineering ethics and responsibilities – Engineering safety	1	CO5, CO6
5.3	Sustainability and SDGs in engineering – Engineering solutions for society	1	CO5, CO6
Total (Hrs)		15	

9. List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1.	Product Teardown and Functional Analysis	Level 1	Obj. 3 – Experimentation	CO1, CO2, CO6
2.	Product Teardown and Design Improvement	Level 2	Obj. 5 – Design	CO1, CO2, CO4, CO6
3.	Measurement of Dimensions and Physical Quantities Using Basic Engineering Instruments.	Level 1	Obj. 1 – Instrumentation	CO3, CO6
4.	Design and Visualization of Basic 3D Geometric Objects Using TinkerCAD	Level 1	Obj. 5 – Design	CO2, CO3
5.	Design and Simulation of a Basic Electrical Circuit Using TinkerCAD	Level 2	Obj. 3 – Experimentation	CO2, CO3, CO4
6.	Data Tabulation and Graph Plotting Using Microsoft Excel	Level 1	Obj. 4 – Data Analysis	CO3
7.	Micro Project	Level 3	Obj. 5 – Design	CO2, CO4, CO5
8.	Case Study – Engineering Ethics and Responsibility	Level 2	Obj. 13 – Ethics & Integrity	CO5, CO6
9.	Technical Report Writing	Level 1	Obj. 11 – Communication	CO5

10. Course Designer(s):

- Dr. S. Baskar, Professor, EEE, and Dean (A&A), sbeee@tce.edu
- Dr. R. Rajan Prakash, Associate Professor, EEE, r_rajanprakash@tce.edu
- Dr. V. Balasubramani, Associate Professor, Mechanical, vbmech@tce.edu

Career Training (CT) Syllabus — EEC Format

Consolidated Document — All Courses

Programme Overview:

Code	Course	Hours	L-T-P-C
26CCAA0	Vision and Speed Maths	30 h	0-0-2-0
26CCAB0	Foundations of Problem Solving - 1	15 h	0-0-1-0
26CCLA0	Building Communication Skills	30 h	0-0-2-1
26CCLB0	Numerical Skills and Quantitative Problem Solving	30 h	0-0-2-1
26CCLCO	Aptitude Skills	30 h	2-0-0-2

26CCAA0	VISION and SPEED MATHS (Common to all Programmes)	Category	L	T	P	Credits
		AC	0	0	2	0

1. Preamble

This course inducts first-year students into the TCT Career Training (CT) framework. It combines a Vision induction — orientation, baseline online assessment, and group counseling — with WOWs, a structured Speed-Maths workshop that introduces mental-arithmetic methods. Together these elements build the motivation, baseline awareness, and computational fluency that support all subsequent CT courses.

2. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage
CO1	Articulate personal and academic goals aligned with the CT programme objectives.	TPS3	2.1.1	20%
CO2	Assess baseline aptitude through diagnostic tests and identify focus areas for improvement.	TPS3	2.1.2	20%
CO3	Apply foundational mental-arithmetic methods (SAW, Oz, Mirror, High 5) to solve numeric problems.	TPS3	1.4.1	20%
CO4	Apply advanced WOWs methods (square/cube roots, Crisscross, Base multiplication) to multi-digit calculations.	TPS3	1.4.1	20%
CO5	Demonstrate computational speed and accuracy in time-bound aptitude challenges.	TPS4	2.4.1	20%

3. Assessment Pattern

CO	CAT1 (% of Marks)	CAT2 (% of Marks)	Terminal Exam (% of Marks)
CO1	50	—	10
CO2	50	—	10
CO3	—	50	20
CO4	—	50	20
CO5	—	—	40
Total	**100**	**100**	**100**

The assessment will be conducted by the Training Team, and the marks will be submitted by the respective faculty in charge.

4. Syllabus

Module 1: Vision — Orientation & Programme Overview

Programme overview – CT framework – Expectations and outcomes – Code of conduct

Module 2: Vision — Diagnostic Online Test

Baseline aptitude assessment – Section-wise diagnosis – Personal scorecard – Improvement plan

Module 3: Vision — Group Counseling & Career Mapping

Career exploration – Goal setting – Strengths / interests mapping – Sector overview – Action planning

Module 4: WOWs — Foundational Methods

SAW method – Oz method – Mirror method – High 5 method – Minion's method – King and Queen method – Square root and cube root – Butterfly method – Inception method

Module 5: WOWs — Advanced Methods

Cube of a number – Goldeneye method – Base multiplication – Crisscross method – Super power method – Cast away method

5. Learning Resources

5.1 Text Book

M. Tyra — "Magical Book on Quicker Maths", BSC Publishing.

5.2 Reference Books & Web Resources

1. Bhanu Prakash — "Quicker Maths", S. Chand Publishing.
2. Arun Sharma — "How to Prepare for Quantitative Aptitude", McGraw Hill.
3. TCT CT Internal Workshop Manual — Speed Maths (WOWs).

6. Course Designer(s)

1. Mr. S. A. R. Sheik Masthan, Asst. Professor, Mechatronics, sarsmech@tce.edu
2. Dr. R. Rajan Praksah, Associate Professor, EEE, r_rajanprakash@tce.edu

26CCAB0	FOUNDATIONS OF PROBLEM SOLVING-1 (Common to all Programmes)	Category	L	T	P	Credits
		AC	0	0	2	0

1. Preamble

This course introduces students to the core habits of structured problem solving. Through algorithmic thinking exercises across numeric, visual, and word-puzzle formats, students learn to decompose problems, identify patterns, and design solution strategies that transfer to both academic problem solving and early recruitment-test contexts.

2. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage
CO1	Explain the principles of algorithmic thinking and structured problem solving.	TPS2	3.3.1	20%
CO2	Apply quantitative reasoning techniques to numeric problems.	TPS3	2.1.2	20%
CO3	Use visual pattern recognition to solve diagram-based puzzles.	TPS3	2.1.2	20%
CO4	Identify shortest-path and optimization strategies in problem solving.	TPS3	2.4.1	20%
CO5	Solve complex word puzzles by decomposing them into smaller logical units.	TPS4	2.2.1	20%

3. Assessment Pattern

CO	CA1 (% of Marks)	CA2 (% of Marks)	Terminal Exam (% of Marks)
CO1	50	—	10
CO2	50	—	10
CO3	—	50	20
CO4	—	50	20
CO5	—	—	40
Total	**100**	**100**	**100**

The assessment will be conducted by the Training Team, and the marks will be submitted by the respective faculty in charge.

4. Syllabus

Module 1: Introduction to Problem Solving and Algorithmic Thinking

Problem-solving framework – Algorithmic mindset – Decomposition – Pattern recognition

Module 2: Thinking with Numbers

Numeric reasoning – Quantitative pattern recognition – Mental shortcuts

Module 3: Thinking with Visual

Diagram-based reasoning – Visual patterns – Figure analogies and series

Module 4: Shortest Path

Shortest-path problems – Optimisation – Route and grid problems

Module 5: Word Puzzles (Part 1 & 2)

Lateral thinking – Word arrangement – Logical inference puzzles – Brain teasers

5. Learning Resources

5.1 Text Book

George Polya — "How to Solve It", Princeton University Press.

5.2 Reference Books & Web Resources

1. R. G. Dromey — "How to Solve It by Computer", Pearson.
2. Edward de Bono — "Lateral Thinking: A Textbook of Creativity", Penguin.
3. Arun Sharma — "How to Prepare for Logical Reasoning", McGraw Hill.

6. Course Designer(s)

1. Mr. S. A. R. Sheik Masthan, Asst. Professor, Mechatronics, sarsmech@tce.edu
2. Dr. R. Rajan Praksah, Associate Professor, EEE, r_rajanprakash@tce.edu

26CCLA0	BUILDING COMMUNICATION SKILLS (Common to all Programmes)	Category	L	T	P	Credits
		EEC	0	0	2	1

1. Preamble

This course builds the foundational English communication competencies students require to participate confidently in academic, internship, and workplace settings. It covers grammar, vocabulary, writing, speaking, and digital-communication etiquette — the four pillars expected by recruiters at the early stages of campus placement.

2. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage
CO1	Apply correct grammar and workplace-appropriate vocabulary in spoken and written contexts.	TPS3	9.2.1	20%
CO2	Compose clear and organized engineering reports, emails, and profile statements with logical flow and clear main ideas.	TPS6	9.1.2	20%
CO3	Speak clearly and confidently in workplace scenarios such as introductions, briefings, and meetings.	TPS3	9.2.1	20%
CO4	Apply critical thinking approaches to examine emerging issues and technical arguments through verbal and written analysis.	TPS3	11.3.1	20%
CO5	Use a variety of workplace communication tools and digital media to produce appropriate outputs, adapting format, style, and etiquette to suit the audience and communication channel.	TPS3	9.3.1	20%

3. Assessment Pattern

CO	CA1 (% of Marks)	CA2 (% of Marks)	Terminal Exam (% of Marks)
CO1	50	—	10
CO2	50	—	10
CO3	—	50	20
CO4	—	50	20
CO5	—	—	40
Total	**100**	**100**	**100**

The assessment will be conducted by the Training Team, and the marks will be submitted by the respective faculty in charge.

4. Syllabus

Module 1: Foundations of Workplace Communication

Course Orientation & Getting Started – Introduction to Workplace Communication – Profile Building for Internships

Module 2: Grammar & Vocabulary

English in the Workplace – Grammar (Parts 1, 2 & 3) – Vocabulary (Parts 1, 2 & 3)

Module 3: Professional Writing

Professional Communication – Writing (Part 1 & 2) – Style, tone and structure for workplace writing

Module 4: Professional Speaking

Professional Communication – Speaking (Part 1, 2 & 3) – Briefings, presentations, and impromptu speech

Module 5: Reasoning, Tools & Digital Communication

Reasoning & Critical Thinking Abilities – Workplace Communication Tools – Social Media, Privacy & Digital Communication – Career Guidance Workshop

5. Learning Resources

5.1 Text Book

Meenakshi Raman & Sangeeta Sharma — "Technical Communication: Principles and Practice", Oxford University Press.

5.2 Reference Books & Web Resources

1. Murphy, Hildebrandt & Thomas — "Effective Business Communication", McGraw Hill.
2. Sanjay Kumar & Pushp Lata — "Communication Skills", Oxford University Press.
3. British Council — Workplace English Resources (web).

6. Course Designer(s)

1. Mr. S. A. R. Sheik Masthan, Asst. Professor, Mechatronics, sarsmech@tce.edu
2. Dr. R. Rajan Praksah, Associate Professor, EEE, r_rajanprakash@tce.edu

26CCLB0	NUMERICAL SKILLS AND QUANTITATIVE PROBLEM SOLVING (Common to all Programmes)	Category	L	T	P	Credits
		EEC	0	0	2	1

1. Preamble

Building on foundational problem-solving habits, this course develops students' ability to handle the quantitative and logical-reasoning sections that dominate placement tests. Students work through the four pillars of campus-recruitment aptitude: algorithmic thinking, logical reasoning, data interpretation, and applied quantitative aptitude.

2. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage
CO1	Apply algorithmic thinking with branching and repetition to multi-step problems.	TPS3	2.1.2	20%
CO2	Solve arrangement-based logical-reasoning problems using diagrammatic methods.	TPS3	2.2.3	20%
CO3	Apply syllogism, logical connectives, and Venn diagrams to deductive problems.	TPS4	2.2.4	20%
CO4	Interpret data and solve data-sufficiency problems efficiently.	TPS4	2.1.2	20%
CO5	Solve quantitative-aptitude problems on number systems, percentages, time-and-work and interest.	TPS3	2.1.2	20%

3. Assessment Pattern

CO	CA1 (% of Marks)	CA2 (% of Marks)	Terminal Exam (% of Marks)
CO1	50	—	10
CO2	50	—	10
CO3	—	50	20
CO4	—	50	20
CO5	—	—	40
Total	**100**	**100**	**100**

The assessment will be conducted by the Training Team, and the marks will be submitted by the respective faculty in charge.

4. Syllabus

Module 1: Algorithmic Thinking with Branching & Repetition

Branching constructs – Iterative problem solving – Trace-and-derive techniques

Module 2: Data Arrangements, Coding-Decoding & Visual Reasoning

Data Arrangements and Relations – Coding & Decoding – Series – Analogy – Odd man out – Visual Reasoning

Module 3: Logical Connectives, Syllogism, Venn Diagrams & Spatial Reasoning

Logical Connectives – Syllogism and Venn Diagrams – Clocks and Calendars – Direction Sense – Cubes

Module 4: Data Interpretation and Data Sufficiency

Tables, bar charts, line graphs, pie charts – Caselets – Data Sufficiency questions

Module 5: Quantitative Aptitude & Resume Progress Check

Time and Work – Number System – Percentages, Simple Interest, Compound Interest – Resume progress check

5. Learning Resources

5.1 Text Book

R. S. Aggarwal — "Quantitative Aptitude for Competitive Examinations", S. Chand.

5.2 Reference Books & Web Resources

1. Arun Sharma — "How to Prepare for Logical Reasoning", McGraw Hill.
2. Nishit K. Sinha — "Logical Reasoning and Data Interpretation", Pearson.
3. Abhijit Guha — "Quantitative Aptitude for Competitive Examinations", McGraw Hill.

6. Course Designer(s)

1. Mr. S. A. R. Sheik Masthan, Asst. Professor, Mechatronics, sarsmech@tce.edu
2. Dr. R. Rajan Praksah, Associate Professor, EEE, r_rajanprakash@tce.edu

26CCLC0	APTITUDE SKILLS (Common to all Programmes)	Category	L	T	P	Credits
		EEC	2	0	0	2

1. Preamble

This course consolidates verbal-ability and quantitative-aptitude skills to the level expected in tier-1 recruitment tests. The verbal component sharpens reading, vocabulary, grammar, and critical reasoning. The quantitative component extends earlier numeracy work into commerce-arithmetic, combinatorics, and rate-based problems frequently tested at campus and off-campus placement rounds.

2. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage
CO1	Interpret long-form passages and answer inferential and detail-based questions accurately.	TPS4	2.2.1	20%
CO2	Apply rules of grammar and usage to correct, complete, and reorder sentences.	TPS3	9.2.1	20%
CO3	Evaluate verbal arguments using critical-reasoning frameworks.	TPS5	11.3.1	20%
CO4	Solve commerce-arithmetic problems involving ratio, profit-loss, partnerships and averages.	TPS3	2.4.1	20%
CO5	Solve combinatorial and rate-based problems (permutation, combination, probability, time-speed-distance).	TPS4	2.1.1	20%

3. Assessment Pattern

CO	CA1 (% of Marks)	CA2 (% of Marks)	Terminal Exam (% of Marks)
CO1	50	—	10
CO2	50	—	10
CO3	—	50	20
CO4	—	50	20
CO5	—	—	40
Total	**100**	**100**	**100**

The assessment will be conducted by the Training Team, and the marks will be submitted by the respective faculty in charge.

4. Syllabus

Module 1: Reading Comprehension & Critical Reasoning

Reading Comprehension – inferential vs literal questions – Critical Reasoning – assumption/inference patterns

Module 2: Sentence Correction, Completion & Para-jumbles

Sentence Correction – Sentence Completion – Para-jumbles – cohesion and coherence

Module 3: Vocabulary, Articles, Prepositions & Interrogatives

Vocabulary building – Articles – Prepositions – Interrogatives

Module 4: Commerce Arithmetic

Ratio and Proportion – Profit and Loss – Partnerships – Averages

Module 5: Combinatorics & Rate Problems

Permutation – Combination – Probability – Time, Speed and Distance

5. Learning Resources

5.1 Text Book

R. S. Aggarwal — "Quantitative Aptitude for Competitive Examinations", S. Chand.

5.2 Reference Books & Web Resources

1. R. S. Aggarwal — "Objective General English", S. Chand.
2. Norman Lewis — "Word Power Made Easy", Goyal Publishers.
3. Wren & Martin — "High School English Grammar and Composition", S. Chand.

6. Course Designer(s)

1. Mr. S. A. R. Sheik Masthan, Asst. Professor, Mechatronics, sarsmech@tce.edu
2. Dr. R. Rajan Praksah, Associate Professor, EEE, r_rajanprakash@tce.edu

26TAAA0	HERITAGE OF TAMILS	Category	L	T	P	Credits
		Audit	1	0	0	0

1. Preamble

Tamil heritage represents a rich blend of culture, literature, art, science, ethics, and social values that have shaped Tamil civilization for centuries. It offers valuable insights into humanism, environmental harmony, indigenous knowledge systems, and inclusive social living. The timeless ideals reflected in Tamil literature and traditions help students develop cultural awareness, ethical responsibility, and global citizenship. This course enables learners to appreciate the contributions of the Tamils and understand the relevance of their heritage in the modern world

2. Prerequisite

NIL

3. Course Outcome:

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

No	Course Outcome	TPS Level	PO Addressed	CO Weightage	SDG addressed	SDG Level
CO1	Explain the historical development of Tamil language and literature, including Sangam literature, Tamil epics, Bhakti movements, and modern literary contributions	TPS2	PO1 – M PO2 – L	20	SDG 4	1
CO2	Explain the significance of Tamil artistic traditions, temple architecture, handicrafts, musical instruments, and their role in preserving Tamil culture.	TPS2	PO1 – M PO2 – L	20	SDG 4	1
CO3	Illustrate the role of Tamil folk and martial art forms in promoting cultural values, community participation, and traditional knowledge.	TPS3	PO1 – S PO2 – M PO3 – L	20	SDG 4	1
CO4	Illustrate the relationship between Sangam literary concepts, socio-economic life, and the environmental and cultural practices of ancient Tamil society.	TPS3	PO1 – S PO2 – M PO3 – L	20	SDG 4	1
CO5	Illustrate the impact of Tamil cultural, literary, and social contributions on Indian society and heritage.	TPS3	PO1 – S PO2 – M PO3 – L	20	SDG 4	1

4. Assessment Pattern

CO	CAT 1	Assignment 1	CAT 2 (MCQ)	Assignment 2	Terminal Exam (MCQ)
	% of marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	-	-	10	10	10
CO2	-	-	10	10	10
CO3	-	-	20	20	20
CO4	-	-	30	30	30
CO5	-	-	30	30	30
Total	**-**	**-**	**100**	**100**	**100**

* The Terminal Examination and CAT-2 shall be conducted as a Multiple-Choice Question (MCQ) examination.

5. Syllabus

Module 1:
Language Families in India – Dravidian Language – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Management Principles in Thirukkural – Tamil Epics and Impact of Buddhism & Jainism in Tamil Land – Bhakti Literature: Azhwars and Nayanmars – Forms of Minor Poetry – Development of Modern Literature in Tamil – Contribution of Bharathiyar and Bharathidasan.

Module 2:
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: Mridangam, Parai, Veenai, Yazh and Nadaswaram – Role of Temples in Social and Economic Life of Tamils.

Module 3:
Therukoothu, Karagattam, Villuppattu, Kaniyan Koothu, Oyilattam, Leather Puppetry, Silambattam, Valari, Tiger Dance – Sports and Games of Tamils.

Module 4:
Flora and Fauna of Tamils – Akam and Puram Concept from Tolkappiam and Sangam Literature – Aram Concept of Tamils – Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age – Overseas Conquest of Cholas.

Module 5:
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 System of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

6. Learning Resources

- தமிழக வரலாறு - மக்களும் பண்பாடும் (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
- கணித் தமிழ் - முனைவர் இல சுந்தரம் (விகடன் பிரசுரம்)
- கீழடி - வைகை நதிக்கரையில் சங்ககால நாகரீகம் (தொல்லியல் துறை வெளியீடு)
- பொருநை ஆற்றங்கரை நாகரீகம் (தொல்லியல் துறை வெளியீடு)
- Social Life of the Tamil – The Classical Period (Dr.K.K.Pillay) A joint publication of TNTB&ESC and RMRL – (inprint)
- Social Life of the Tamils- The Classical Period (Dr.S.Singaravelu) Published by: International Institute of TamilStuies.
- Historial Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu)) Published by: International Institute of TamilStuies.
- The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) Published by: International Institute of TamilStuies
- Keeladi – Sangam City Civilzation on the banks of river Vaigai (Jointly Published Department of Archaeology & Tamil Nadu Text Book and Educational Servics Corporation,Tamilnadu)
- Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillai, Publisher by The Author)

- Porunai Civilization (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Education Service Corporation, TamilNadu)
- Journey of Civization indus to Vaigai (R.Balakrishnan) Published by: RMRL – Reference Book

1. Course Contents and Lecture Schedule

Module No.	Topics	No. of Periods
1	**LANGUAGE AND LITERATURE**	
1.1	Language Families in india – Dravidean Language – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature	1
1.2	Management Principles in Thirukural – Tamil Epics and impact of Buddhism & jainesm in Tamil Land – Bakthi Literature Azhwar and Nayanmars	1
1.3	Forms of minor Poetry – Development of Modern Literature in Tamil – Contribution of Bharathiyar and Bharathidhasan.	1
2	**HERITAGE – ROCK ART PAINTING TO MODERN ART – SUCLPUTRE**	
2.1	Hero Stone to Modern Sculputre – Bronze icons – tribes and their handicrafts – Art of Temples car making	1
2.2	Massive Terracotta Sculputres, Village deties, Thiruvalluvar State at Kanyakumari, Making of musical instruments	1
2.3	Mridhangam, Parai,Veenai, Yazh and Nadhaswaram-Role of Temples in Social and Economic Life of Tamils.	1
3	**FOLK AND MARTIAL ARTS**	
3.1	Therukoothu, Karagattam,Villu Pattu,	1
3.2	Kaniyan koothu,Oyillattam,Leather puppertry,	1
3.3	Silambattam,Valari,Tiger dance-Sports and Games of Tamils.	1
4	**THINAI COCEPT OF TAMILS**	
4.1	Flora and Fauna of Tamils &Aham and Puram Concept forTholkappiam and Sangam Litearture	1
4.2	Aram Concept of Tamils – Education and Literacy during Sangam Age	1
4.3	Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age- Overseas Conduest of Cholas.	1
5	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	
5.1	Contribution of Tamils TO Indian Freedom Struggle	1
5.2	The Cultural Influnence of Tamils over the other parts of India – Self – Respect Movement	1
5.3	Role of Siddha Medicine in Indigenous System of Medicine – Inscription & Manuscripts – Print History of Tamil Books	1
	Total	15

Course Designers:

Mr. M Babu.mbutce@tce.edu

26TAAB0	TAMILS AND TECHNOLOGY	Category	L	T	P	Credits
		Audit	1	0	0	0

1. Preamble

The Tamil language is not merely a tool for communication; it is a repository of the knowledge, way of life, and scientific thought of the Tamil people, spanning millennia.

Today, Tamils are making their mark in the realms of computing and the internet. Their contributions are immense, ranging from leading global technology companies to playing pivotal roles in Artificial Intelligence (AI) and space exploration (ISRO/NASA). Simultaneously, the development of 'Computational Tamil' and internet-based Tamil is gaining momentum, ensuring the language is passed on to the next generation.

The technological acumen of the Tamil people did not emerge overnight; it is ingrained in their very DNA. By cherishing tradition, embracing innovation, and keeping pace with global technological advancements, Tamils continue to stand as pioneers.

2. Prerequisite

NIL

3. Course Outcome:

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

No	Course Outcome	TPS Level	PO Addressed	CO Weightage	SDG addressed	SDG Level
CO1	Explain the historical Sangam Age Ceramic Technology Graffiti on Potteries	TPS2	PO1 – M PO2 – L	20	SDG 4	1
CO2	Explain the durig Sangam Age Strucural Contution House & Designs in Household materials	TPS2	PO1 – M PO2 – L	20	SDG 4	1
CO3	Metallurgical studies Art of Ship steel – Copper and gold- Coins as source of history Shell beads	TPS3	PO1 – S PO2 – M PO3 – L	20	SDG 4	1
CO4	Agricuture and Agro Procesing Ancient Knowledge of Ocean	TPS3	PO1 – S PO2 – M PO3 – L	20	SDG 4	1
CO5	Development of Scientific Tamil And Tamil computing	TPS3	PO1 – S PO2 – M PO3 – L	20	SDG 4	1

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT 2 (MCQ)	Assignment 2	Terminal Exam (MCQ)*
	% of marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	-	-	10	10	10
CO2	-	-	10	10	10
CO3	-	-	20	20	20
CO4	-	-	30	30	30
CO5	-	-	30	30	30
Total	**-**	**-**	**100**	**100**	**100**

* The Terminal Examination and CAT 2 shall be conducted as a Multiple-Choice Question (MCQ) examination.

5. Syllabus

Module 1:

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

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Module 2:

Desiging and Strucural Contution House & Designs in Household materials durig Sangam Age – Building materials and Hero stone os 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 House, Indo-Saracenic Architecture at Madras during British Peroiod.

Module 3:

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

Module 4:

Dam,Tank,Ponds,Stuice,Signification of Kumizhi Thoompu of Cholo Period, Animal Husbandry-Wells designed for cattle use – Agricuture and Agro Procesing – Knowledge of Sea – Fisheries-Pearl-Conche diving –Ancient Knowledge of Ocean – Knowledge Specific Society.

Module 5:

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

6. Learning Resources

- தமிழக வரலாறு - மக்களும் பண்பாடும் தமிழ்நாடு பாடநூல் :வெளியீடு) (மற்றும் கல்வியியல் பணிகள் கழகம்
- கணித் தமிழ் - முனைவர் இல.சுந்தரம் விகடன் பிரசுர)ம்(
- கீழடி - வைகை நதிக்கரையில் சங்ககால நாகரீகம் தொல்லியல் துறை) (வெளியீடு
- பொருநை ஆற்றங்கரை நாகரீகம் (தொல்லியல் துறை வெளியீடு)
- Social Life of the Tamil – The Classical Period (Dr.K.K.Pillay) A joint publication of TNTB&ESC and RMRL – (inprint)
- Social Life of the Tamils- The Classical Period (Dr.S.Singaravelu) Published by: International Institute of TamilStuies.
- Historial Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu)) Published by: International Institute of TamilStuies.
- The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) Published by: International Institute of TamilStuies.
- Keeladi – Sangam City Civilzation on the banks of river Vaigai (Jointly Published Department of Archaeology & Tamil Nadu Text Book and Educational Servics Corporation,Tamilnadu)

- Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillai, Publisher by The Author)
- Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Education Service Corporation, TamilNadu)
- Journey of Civization indus to Vaigai (R.Balakrishnan) Published by: RMRL – Reference Book

2. Course Contents and Lecture Schedule

Module No.	Topics	No. of Periods
1	**WEAVING AND CERAIC TECHNOLOGY**	
1.1	Weaving Industry Sangam Age – CeramicTechnology	1
1.2	Black and Red Ware Potteries(BRW)	1
1.3	Graffiti on Potteries.	1
2	**DESIGN AND CONSTRUCTION TECHNOLOGY**	
2.1	Desiging and Strucural Contution House & Designs in Household materials durig Sangam Age – Building materials and Hero stone os Sangam age	1
2.2	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)	1
2.3	Thirumalai Nayakar Mahal – Chetti Nadu House, Indo-Saracenic Architecture at Madras during British Peroiod.	1
3	**MANUFACTURING TECHNOLOGY**	
3.1	Art of Ship Building – Metallurgical studies – iron industry –iron smelting, steel – Copper and gold- Coins as source of history – Minting of Coins	1
3.2	Beads making – industries Stone beads- Glass beads-Terracotta beads – Shell beads / bone beats	1
3.3	Archeological evidences- Gen stone types described in Silappathikaram.	1
4	**ARGRICULTURE AND IRRIATION TECHNOLOGY**	
4.1	Dam,Tank,Ponds,Stuice,Signification of Kumizhi Thoompu of Cholo Period	1
4.2	Animal Husbandry-Wells designed for cattle use – Agricuture and Agro Procesing	1
4.3	Knowledge of Sea – Fisheries-Pearl-Conche diving –Ancient Knowledge of Ocean – Knowledge Specific Society.	1
5	**SCIENTIFIC TAMIL & TAML COMPUTING**	
5.1	Development of Scientific Tamil – Tamil computing	1
5.2	Digitalization of Tamil Books- Development of Tamil Software – Tamil Virtual Academy	1
5.3	Tamil Digital Library – Online Dictionaries – Sorkuvai Project	1
	Total	15

Course Designers:

Mr. M Babu.mbutce@tce.edu

26MESB0	LINEAR ALGEBRA AND VECTOR CALCULUS	Category	L	T	P	Credits	TE Type
		BSC	2	1	0	3	Theory

Preamble

Linear Algebra and Vector Calculus provides a strong mathematical foundation for solving engineering problems encountered in Mechanical Engineering. It introduces the concepts of linear algebra, matrices, vector calculus, and ordinary differential equations, which are essential for modeling and analyzing physical systems. The course emphasizes analytical techniques used in areas such as mechanics, fluid dynamics, heat transfer, vibration analysis, and computational methods.

Prerequisite

- Nil

Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Apply concepts of vector spaces, subspaces, basis, and dimension to solve linear algebra problems.	TPS3	1.1.1	13%	SDG4	2
CO2	Use Gram–Schmidt process to determine orthonormal bases and apply QR factorization in matrix computations.	TPS3	1.1.1	20%	SDG4	2
CO3	Calculate the Eigenvalues, Eigenvectors and decomposition of matrices.	TPS3	1.1.1	17%	SDG4	2
CO4	Compute gradient, directional derivative, divergence and curl in scalar and vector fields.	TPS3	1.1.1	13%	SDG4	2
CO5	Apply line integrals, Green's, Gauss divergence, and Stokes' theorems to solve engineering problems involving vector fields.	TPS3	1.1.1	20%	SDG4	2
CO6	Solve second-order homogeneous ordinary differential equations with constant coefficients and Euler–Cauchy equations.	TPS3	1.1.1	17%	SDG4	2

Assessment Pattern

CO	CAT 1	Assignment 1	CAT 2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	26	26	-	-	13
CO2	40	40	-	-	20
CO3	34	34	-	-	17
CO4	-	-	26	26	13
CO5	-	-	40	40	20
CO6	-	-	34	34	17
Total	**100**	**100**	**100**	**100**	**100**

Syllabus

LINEAR ALGEBRA

Vector spaces: Definition and Examples – Subspaces - Linear independence - Basis and Dimension – Inner product spaces - Orthonormal sets - The Gram-Schmidt orthogonalization process- QR Factorization.

MATRICES

Eigen values and Eigen vectors – Diagonalization - Singular value decomposition.

VECTOR CALCULUS

Gradient of a Scalar field - Directional Derivative - Divergence of a Vector Field - Curl of a Vector Field – Line Integrals - Green's Theorem in the plane - Surface Integrals - Triple Integrals: Divergence Theorem of Gauss – Stokes's Theorem.

ORDINARY DIFFERENTIAL EQUATIONS

Homogeneous Linear ODEs of Second Order – Homogeneous Linear ODEs with constant coefficients – Euler Cauchy Equations.

Learning Resources

Text Book

1. Steven J. Leon and Lisette G.de Pillis "Linear Algebra with Applications", Pearson, Tenth edition, Global edition 2021.

2. Erwin Kreyszig, "Advanced Engineering Mathematics",10th edition, Wiley, 2017.

Reference Books & Web resources

1. David C. Lay, "Linear Algebra and its Applications", 3rd edition, Pearson Education, New Delhi, 2019.
2. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2017.
3. B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi, 2014.
4. https://nptel.ac.in/courses/111105121
5. https://nptel.ac.in/courses/111105122
6. https://www.coursera.org/specializations/linear-algebra-elementary-to-advanced
7. https://nptel.ac.in/courses/111107111

Course Contents and Lecture Schedule

Module No.	Topics	No. of Periods
	Linear Algebra	
1.1	Vector Space: Definition and Examples	1
1.2	Subspaces	1
	Tutorial	1
1.3	Linear Independence of Vectors	1
1.4	Basis and Dimension	1
	Tutorial	1

1.5	Inner product spaces, Orthonormal sets	1
1.6	The Gram-Schmidt orthogonalization process	2
	Tutorial	1
1.7	QR Factorization	1
	Tutorial	1
	Matrices	
2.1	Eigen values and Eigen vectors	1
	Tutorial	1
2.2	Diagonalization	1
2.3	Singular value decomposition	2
	Tutorial	1
	Vector Calculus	
3.1	Gradient of a Scalar Field - Directional Derivative	1
3.2	Divergence of a Vector Field	1
	Tutorial	1
3.3	Curl of a Vector Field	1
3.4	Line Integrals, Green's Theorem in the plane	1
	Tutorial	1
3.5	Surface Integrals	1
3.6	Triple Integrals: Divergence Theorem of Gauss	2
	Tutorial	1
3.7	Stokes's Theorem	1
	Tutorial	1
	Ordinary Differential Equations	
4.1	Homogeneous Linear ODEs of Second Order	1
4.2	Homogeneous Linear ODEs with Constant Coefficients	2
	Tutorial	1
4.3	Euler-Cauchy Equations	1
	Tutorial	1
	Total	**36**

Course Designer(s):

S.No.	Name	Designation	Department	Email id
1.	Dr. S. Saravanakumar	Assistant Professor	Mathematics	sskmat@tce.edu
2.	Dr. P. Balamanikandan	Assistant Professor	Mathematics	pbmmat@tce.edu
3.	Dr. S. Vinoth	Assistant Professor	Mathematics	svmat@tce.edu

26CHSA0	ENGINEERING CHEMISTRY

Category	L	T	P	Credit
BSC	3	0	0	3

1. Preamble

Engineering Chemistry provides a strong foundation in chemical principles relevant to modern engineering applications. It enables students to develop analytical thinking, problem-solving ability, and scientific competence through theoretical and practical learning and addresses the industrial and environmental needs.

2. Prerequisite

Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain water quality parameters and assessment techniques, including IOT based sensors, to assess water suitability for domestic, industrial, and boiler applications.	TPS2	1.2.1	10 %	SDG 3 SDG 6	2
CO2	Apply standard estimation techniques, appropriate water treatment methods to select and justify solutions for boiler feed water preparation and industrial effluent treatment.	TPS3	1.2.1	20 %	SDG 6	2
CO3	Apply the principles and instrumentation of spectroscopic techniques to identify materials and interpret spectra for chemical, environmental, biomedical, and space applications.	TPS3	1.2.1	20 %	SDG 3	2
CO4	Use alternate fuels based on their production methods, properties, for engineering and real-world energy requirements	TPS3	1.2.1	20 %	SDG 13	2
CO5	Apply the concepts of corrosion control methods in engineering applications	TPS3	1.2.1	10 %	SDG 9	2
CO6	Apply the properties of advanced materials for suitable engineering and technological applications	TPS3	1.2.1	20 %	SDG 9 SDG 12	2

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20	-	-	-	10
CO2	40	50	-	-	20
CO3	40	50	-	-	20
CO4	-	-	40	50	20
CO5	-	-	20	-	10
CO6	-	-	40	50	20
Total	100	100	100	100	100

5. Syllabus

WATER: Water Quality parameters: Physical, Chemical, Biological - Alkalinity - Hardness of water: types -determination of hardness by EDTA method - Boiler trouble – Langelier Index (L.I.)- Softening of water: Internal and External treatment methods – Ion-Exchange method, Desalination process: reverse- and forward osmosis, electro dialysis, solar and multistage flash distillation, Advanced oxidation process for Effluent Treatment. IOT-based sensor for water quality monitoring. [10 hours]

SPECTROSCOPIC TECHNIQUES AND APPLICATIONS: Principle, instrumentation, and applications: UV–Visible spectroscopy- Fluorescence - Inductively Coupled Plasma-Optical Emission, Infra-red - Nuclear magnetic resonance, Magnetic resonance imaging - Spectroscopy in automobile, environmental, biomedical & space applications. Fundamentals of Ultrafast spectroscopic techniques [8 hours]

ALTERNATE FUELS: Classification and combustion of fuels- calorific value- Determination of calorific value by Bomb calorimeter- Dulong's formula. Introduction to alternate fuels- properties and applications of important alternate fuels such as LPG, CNG, ethanol, hydrogen, biodiesel and biogas – Euro and Bharat Stage (BS) emission standards – emission testing and analysis. [6 hours]

CORROSION AND PROTECTIVE COATINGS: Basics of electrochemistry –Introduction- Causes and effects of corrosion; Types of corrosion, factor affecting corrosion- Corrosion control methods - Protective coatings - Methods of applying Protective Coatings on Metals– Organic surface coatings–Paints–Constituents and their functions–Pigment Volume Concentration. Electroplating [6 hours]

ADVANCED MATERIALS CHEMISTRY: Bonding and the properties of materials- polymer and polymer nanocomposites- Ceramics and refractories. Nanomaterials: Introduction and classification of nanomaterials; preparation and applications of nanomaterials, COF & MOF, Carbon based materials. [6 hours]

6. Learning Resources

6.1 Text Book

- P.C. Jain and Monica Jain, A Textbook of Engineering Chemistry, Dhanpat Rai publications, New Delhi, 17th edition, 2018.

6.2 Reference Books & Web resources

- S.S. Dara and S.S. Umare, "A Textbook of Engineering Chemistry", S.Chand & Company, 12th Edition, Reprint, 2022.
- V. K. Ahluwalia, Instrumental Methods of Chemical Analysis, Springer Cham, 1st Edition,

2023.

- A. K. Bhargava, Engineering Materials: Polymers, Ceramics and Composites, Prentice Hall India Learning Private Limited, 2nd Edition, 2012

7. Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1	**WATER**	
1.1	Importance of water, standards for drinking water, (WHO, BIS & ICMR standards) physical, chemical & biological characteristics, Alkalinity (principle only)	2
1.2	Hardness of water - types, units. Determination of hardness byEDTA method and numerical problems	2
1.3	boiler trouble: Scale and sludge formation, Langelier saturation index, boiler corrosion, priming and foaming, caustic embrittlement	1
1.4	Internal treatment methods: Carbonate, Phosphate, Colloidal, Calgon conditioning	1
1.5	softening of water: ion exchange process	1
1.6	External treatment method: Desalination- reverse osmosis, electro dialysis, multistage flash distillation	1
1.7	Effluent Treatment - Advanced oxidation process. IOT-based sensor for water quality monitoring	2
2	**SPECTROSCOPIC TECHNIQUES AND APPLICATIONS**	
2.1	Introduction to Electromagnetic Radiation, Types of atomic and molecular spectra	1
2.2	Principle, Instrumentation and Applications: UV–Visible spectroscopy and Fluorescence spectroscopy	2
2.3	Inductively Coupled Plasma -Optical Emission Spectroscopy	2
2.4	Infra-red spectroscopy	1
2.5	Nuclear magnetic resonance spectroscopy (Principle and Instrumentation)- Magnetic resonance imaging	1
2.6	Spectroscopy in automobile, environmental, biomedical & space applications	1
3.0	**ALTERNATE FUELS**	
3.1	Classification and combustion of fuels- calorific value- Determination of calorific value by Bomb calorimeter- Dulong's formula	1
3.2	Introduction to alternate fuels, their need and environmental benefits – sources, production methods, properties and applications of important alternate fuels such as LPG, CNG, ethanol, hydrogen, biodiesel and biogas	3
3.3	basic modifications in SI and CI engines for alternate fuel operation – automobile emissions and their effects,	1
3.4	Euro and Bharat Stage (BS) emission standards – emission testing and analysis using 5 gas analyzer for cars and two-wheelers.	1
4.0	**CORROSION AND PROTECTIVE COATINGS**	
4.1	Electrochemistry- Introduction– Basics of electrochemistry – Redox process, EMF	1

4.2	Introduction- Causes and effects of corrosion; Types of corrosion- chemical (oxidation corrosion) and electrochemical corrosion,	1
4.3	Factor affecting corrosion	1
4.4	Corrosion control methods - cathodic protection - sacrificial anodic protection and impressed current cathodic protection	1
4.5	Methods of applying Protective Coatings on Metals (Galvanizing and Electroplating)	1
4.6	Paints–Constituents and their functions–Pigment Volume Concentration.	1
5.0	**ADVANCED MATERIALS CHEMISTRY**	
5.1	Bonding and the property of materials - melting point - brittleness, ductility –thermal, electrical, magnetic and ionic conductivity - optical - hydrophobic, hydrophilic properties	1
5.2	Polymer and polymer composites- (classification and types)	1
5.3	Ceramics and refractories - types and properties	2
5.4	Nanomaterials: Classification, structure, property and applications	1
5.5	Carbon based materials (graphene and carbon fibres), COF & MOF structure, properties and applications.	1

8. Course Designer(s):

Dr. M. Kottaisamy, Professor, Chemistry, mmksami@tce.edu

Dr. S. Sivailango, Assistant Professor, Chemistry, drssilango@ tce.edu

Dr. A. Ramalinga Chandra Sekar, Assistant Professor, Chemistry, arcchem@ tce.edu

Dr. A.J. Sunija, Assistant Professor, Chemistry, ajschem@ tce.edu

Dr. R. Raj Kumar, Assistant Professor, Chemistry, rkrchem@ tce.edu

26MEEB0	ENGINEERING MATERIALS AND METALLURGY	Category	L	T	P	Credits	TE Type
		ESC	3	0	0	3	Theory

Preamble

Metallic crystal structures, classification and selection of specific engineering materials are addressed for the demanding industrial applications. This course provides knowledge of crystalline defects, strengthening mechanism, and testing of materials for predicting mechanical properties. It also covers phase diagram for ferrous, heat treatment, surface treatment of steel, Alloy steel, tool steels, and cast iron.

Prerequisite

- Nil

Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Select suitable material on the basis of its structure and properties for a specific application	TPS3	1.4.1	15	SDG9	1
CO2	Explain the types of crystal defects, mechanisms of plastic deformation, and strengthening mechanisms in engineering materials.	TPS2	1.2.1	15	SDG9	1
CO3	Apply mechanical testing techniques and stress–strain relationships to determine the mechanical properties of engineering materials.	TPS3	1.4.1	20	SDG9	1
CO4	Illustrate various phases, phase percentage, invariant reactions, micro structure development of Ferrous systems using phase diagrams	TPS2	1.2.1	15	SDG9	1
CO5	Select appropriate heat treatment and surface hardening process for Ferrous metals	TPS3	1.4.1	20	SDG12	1
CO6	Select suitable material for the stated machine tool fabrication and cutting operations	TPS3	1.4.1	15	SDG9	1

Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	30	30			15
CO2	30	30			15
CO3	40	40			20
CO4			30	30	15
CO5			40	40	20
CO6			30	30	15
Total	**100**	**100**	**100**	**100**	**100**

Syllabus

Module 1:

Structure, Properties, and Selection of Engineering Materials:

Introduction to crystals, Unit cells, Metallic crystal structures, Classification and properties of materials, Metals and Alloys, Polymers, Ceramics, Composites, Biomaterials and Semiconductors. Selection of Engineering Materials: Material selection approach, selection process.

Module 2:

Imperfection in solids and strengthening mechanism:

Point, Line, Surface and Volume defects, Dislocations and plastic deformation, slip systems, slip in single crystals, Deformation by twinning, Mechanisms of strengthening: solid solution strengthening, strengthening by Grain Size Reduction, Strain Hardening, Recovery, Recrystallization, and Grain Growth.

Module 3:

Mechanical property characterization:

Tensile, compression, and Torsion tests, Young's modulus, Shear Modulus, True stress and strain, Engineering stress and strain, Stress-strain curves, Generalized Hooke's law, Yielding and yield strength, Ductility, Resilience, Toughness and Elastic recovery, Hardness: Rockwell, Brinell and Vickers.

Module 4:

Phase Diagrams:

Alloys, Substitutional and Interstitial solid solutions, Hume-Rothery Rules, Eutectic, Eutectoid, Peritectic, Peritectoid and Monotectic reactions, Iron-Iron carbide phase diagram and Microstructural aspects of Ferrite, Austenite, Pearlite, Ledeburite, and Cementite, Applications of Copper alloys: Brass, Bronze, Aluminium Alloys, Al-Cu, Nickel and Titanium alloys.

Module 5:

Heat Treatment and Surface Treatment of Steel:

Annealing, stress relieving, process annealing, spheroidising, Full annealing, Normalizing, Hardening, Tempering, TTT diagram, Continuous cooling curves, Martempering, Austempering and Ausforming, Hardenability, Mechanism of heat removal during quenching, Quenching medium.

Surface Hardening of steel: Carburising, Nitriding, Cyaniding, Carbonitriding, Flame Hardening, and Induction Hardening.

Module 6:

Metallic Materials:

Alloy Steels: Purpose of alloying, Effect of alloying elements.

Tool Steels: Classifications and selection of tool steels.

Cast Irons: Types and Mechanical properties of Gray Cast Iron, White Cast Iron, Malleable Cast Iron, Nodular Cast Iron and Compacted Graphite Iron.

Learning Resources

Text Book

1. Callister W.D and Rethwisch D.G, “Materials Science and Engineering – an Introduction”, Wiley, 10th Edition, 2020.
2. Sidney H. Avner, “Introduction to Physical Metallurgy”, Tata McGraw Hill, New Delhi, 2nd Edition, 5th reprint, 2011.

Reference Books & Web resources

1. William F Smith, Javad Hashemi, Ravi Prakash, “Materials Science and Engineering”, McGraw Hill Education, 5th Edition, 2013
2. George E. Dieter, “Mechanical Metallurgy”, McGraw Hill Education, 3rd Edition, 2013.
3. Van Vlack L.H., “Elements of Materials Science and Engineering”, 6th Edition, Pearson Education, 2002.
4. Rajan.T.V., Sharma C.P., Ashok Sharma., “Heat Treatment Principles and Techniques”, Prentice Hall India Learning Private Limited, 2nd Edition, 2011.
5. https://nptel.ac.in/courses/112104203/
6. https://nptel.ac.in/courses/113107078/
7. https://nptel.ac.in/courses/113105023/
8. https://nptel.ac.in/courses/113106032/
9. https://nptel.ac.in/courses/113105024/

Course Contents and Lecture Schedule

Module No	Topics	No of Periods
1	**Structure, Properties, and Selection of Engineering Materials**	
1.1	Introduction to crystals, Unit cells, Metallic crystal structures	01
1.2	Classification and properties of materials, Metals and Alloys, Polymers, Ceramics, Composites, Biomaterials and Semiconductors.	02
1.3	Selection of Engineering Materials: Material selection approach, selection process.	01
2	**Imperfection in solids and strengthening mechanism**	
2.1	Point, Line, Surface and Volume defects	02
2.2	Dislocations and plastic deformation, slip systems, slip in single crystals, Deformation by twinning	02
2.3	Mechanisms of strengthening: solid solution strengthening, strengthening by Grain Size Reduction, Strain Hardening,	02
2.4	Recovery, Recrystallization, and Grain Growth	01
3	**Mechanical property characterization**	
3.1	Tensile, compression, and Torsion tests, Young’s modulus, Shear Modulus	02
3.2	True stress and strain, Engineering stress and strain, Stress-strain curves, Generalized Hooke’s law, Yielding and yield strength	02
3.3	Ductility, Resilience, Toughness and Elastic recovery	01
3.4	Hardness: Rockwell, Brinell and Vickers	02

4	**Phase Diagrams**	
4.1	Alloys, Substitutional and Interstitial solid solutions, Hume-Rothery Rules	01
4.2	Eutectic, Eutectoid, Peritectic, Peritectoid and Monotectic reactions	01
4.3	Iron-Iron carbide phase diagram and Microstructural aspects of Ferrite, Austenite, Pearlite, Ledeburite, and Cementite	02
4.4	Applications of Copper alloys: Brass, Bronze, Aluminium Alloys, Al-Cu, Nickel and Titanium alloys.	01
5	**Heat Treatment and Surface Treatment of Steel**	
5.1	Annealing, stress relieving, process annealing, spheroidising, Full annealing	01
5.2	Normalizing, Hardening, Tempering	01
5.3	TTT diagram, Continuous cooling curves	02
5.4	Martempering, Austempering and Ausforming	01
5.5	Hardenability, Mechanism of heat removal during quenching, Quenching medium.	01
5.6	Surface Hardening of steel: Carburising, Nitriding, Cyaniding, Carbonitriding	01
5.7	Flame Hardening, and Induction Hardening.	01
6	**Metallic Materials**	
6.1	Alloy Steels: Purpose of alloying, Effect of alloying elements	02
6.2	Tool Steels: Classifications and selection of tool steels.	01
6.3	Cast Irons: Types and Mechanical properties of Gray Cast Iron, White Cast Iron, Malleable Cast Iron, Nodular Cast Iron and Compacted Graphite Iron	02
	Total Periods	**36**

Course Designer(s):

S.No.	Name	Designation	Department	Email id
1.	Dr. PL. K. Palaniappan	Professor	Mechanical Engineering	kpal@tce.edu
2.	Dr. S. Umar Sherif	Assistant Professor	Mechanical Engineering	susmech@tce.edu

26MECC0	ENGINEERING THERMODYNAMICS	Category	L	T	P	Credits	TE Type
		PCC	3	0	0	3	Theory

Preamble

Thermodynamics plays a critical role in the design and analysis of engineering systems such as automotive engines, rockets, jet engines, power plants, and refrigeration and air-conditioning systems. A sound understanding of thermodynamic laws is essential for mechanical engineers to effectively design and optimize these systems.

Prerequisite

- Engineering Mathematics
- Physics

Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Apply the First Law of Thermodynamics to calculate energy transfers and property changes for ideal gases in closed system processes.	TPS3	1.3.1.	15	SDG7-Affordable & Clean Energy,	1
CO2	Apply the Steady Flow Energy Equation (SFEE) to calculate energy changes and fluid properties in open systems for steam and ideal gases	TPS3	1.3.1.	20	SDG7-Affordable & Clean Energy, SDG 13-Climate Action	1
CO3	Compute the efficiency and COP of thermal cycles to solve performance problems for heat engines, refrigerators, and heat pumps.	TPS3	1.3.1.	15	SDG7-Affordable & Clean Energy,	1
CO4	Apply Second Law principles to compute entropy change, availability, and second-law efficiency for open and closed systems.	TPS3	1.3.1.	20	SDG7-Affordable & Clean Energy,	1
CO5	Apply Dalton's and Amagat's laws to calculate thermodynamic property changes in ideal gas mixtures.	TPS3	1.2.1	15	SDG7-Affordable & Clean Energy,	1
CO6	Apply thermodynamic relations and psychrometric charts to compute moist air properties and solve for state changes in psychrometric processes.	TPS3	1.3.1.	15	SDG7-Affordable & Clean Energy,	1

Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	30	25			15
CO2	40	50			20
CO3	30	25			15
CO4			40	50	20
CO5			30	25	15
CO6			30	25	15
Total	**100**	**100**	**100**	**100**	**100**

Syllabus

MODULE 1- Basic Concepts: Definition and applications **-** Open, closed and isolated systems – System and control volume approach - Thermodynamic properties, State and Equilibrium, Processes and cycles, - Zeroth Law of thermodynamics. Ideal gas and real gas – compressible and incompressible fluid - Work and Heat- Sign convention, pdV work, non-flow work and flow work, Stored Energy — Internal energy, Kinetic energy and Potential energy, Enthalpy — Definition, physical significance and applications

MODULE 2- First law of Thermodynamics: First Law of Thermodynamics for a Closed System undergoing a Cycle, First Law for a Process — Non-flow Energy Equation (NFEE), Enthalpy and Internal Energy relations for ideal and real gases, Application of NFEE to constant pressure, volume, temperature and polytropic processes

Sensible heat and latent – phase diagrams of water/steam (p-v, p-T, T-v, T-s, h-s) - Tables and charts of physical properties.

Steady State Steady Flow (SSSF) Process — assumptions and derivation, Steady Flow Energy Equation (SFEE) — general and simplified forms, Application of SFEE to: Turbines, Compressors, Pumps, Nozzles, Diffusers, Boilers, Condensers, Throttling Valves, Heat Exchangers. Limitation of First Law.

MODULE 3- Second Law of Thermodynamics: Introduction to need for Second Law, Thermal Reservoir-Source and Sink; Heat Engine, Heat Pump and Refrigerator- Second law statements and its equivalence-reversible and irreversible processes- Carnot Cycle, Efficiency and COP - Carnot theorem - Absolute thermodynamic temperature scale.

MODULE 4- Entropy: Clausius inequality – Entropy - Definition as a thermodynamic property - change of entropy for solids, liquids and gases in different thermodynamic processes- T-ds relation, Principle of increase of entropy -Entropy Generation-Third law of thermodynamics-Thermodynamic relations-Maxwell's relations, Clausius-Clapeyron equation, The Joule-Thomson co-efficient.

MODULE 5- Exergy and Anergy: High grade and low energy, Exergy and Anergy, Availability and Irreversibility for open and closed system processes - II law Efficiency.

MODULE 6- Gas mixture: Avogadro's law, composition of gas mixture, Dalton's law of partial pressure, Amagot's law, Gibbs theorem property equations and change of properties of gas mixture.

MODULE 7-Psychrometric properties, processes: Psychrometric properties, Psychrometric processes- Sensible heating, Sensible cooling, heating and humidification, cooling and dehumidification, adiabatic mixing of two stream, bypass factor, SHF and its application in heat load calculation.

Learning Resources

Text Book

1. Cengel, Y and M. Boles, **Thermodynamics - An Engineering Approach**, Tata McGraw Hill,9th Edition, 2019.
2. Nag, P.K., '**Engineering Thermodynamics**', 5thedition, Tata McGraw Hill, 2017.

Reference Books & Web resources

1. Venkatesh, A., '**Basic Engineering Thermodynamics**', University Press, 2007.
2. Rajput, R.K., '**Engineering Thermodynamics**', Fifth Edition, Laxmi Publications, 2016
3. ValanArasu, A., '**Engineering Thermodynamics**', 2ndedition,Vijay Nicole Imprints Pvt. Ltd., Chennai, 2014.
4. https://nptel.ac.in/courses/112105123/
5. https://www.youtube.com/watch?v=Sn_TSa7AkMU
6. https://www.youtube.com/watch?v=4RX_lpoGRBg
7. https://www.youtube.com/watch?v=SQEkhVUM_Kw

Tables and Charts

1. R.S. Khurmi , "Steam tables with Mollier Diagram ", S. Chand publication

Course Contents and Lecture Schedule

Module No.	Topics	No.of Periods
1	**Basic Concepts:**	
1.1	Definition and applications **-** Open, closed and isolated systems – System and control volume approach - Thermodynamic properties, State and Equilibrium, Processes and cycles	1
1.2	Zeroth Law of thermodynamics. Ideal gas and real gas – compressible and incompressible fluid - Work and Heat- Sign convention, pdV work, non-flow work and flow work	1
1.3	Stored Energy — Internal energy, Kinetic energy and Potential energy, Enthalpy — Definition, physical significance and applications	1
2	**First law of Thermodynamics:**	
2.1	First Law of Thermodynamics for a Closed System undergoing a Cycle, First Law for a Process — Non-flow Energy Equation (NFEE), Enthalpy and Internal Energy relations for ideal and real gases, Application of NFEE to constant pressure	1
2.2	Application of NFEE to constant volume, temperature, Adiabatic and polytropic processes	1
	Discussion, Activity and Tutorials	2
2.3	Sensible heat and latent – phase diagrams of water/steam (p-v, p-T, T-v, T-s, h-s) - Tables and charts of physical properties. Simple problems	1
2.4	Steady State Steady Flow (SSSF) Process - assumptions and derivation, Steady Flow Energy Equation (SFEE) general and simplified forms.	1
2.5	Application of SFEE to: Turbines, Compressors, Pumps, Nozzles, Diffusers, Boilers, Condensers, Throttling Valves, Heat Exchangers. Limitation of First Law	1
	Discussion, Activity and Tutorials	2

Module No.	Topics	No.of Periods
3	**Second Law of Thermodynamics:**	
3.1	Introduction to need for Second Law, Thermal Reservoir-Source and Sink; Heat Engine, Heat Pump and Refrigerator- Second law statements and its equivalence-	1
3.2	reversible and irreversible processes- Carnot Cycle, Efficiency and COP -	1
3.3	Carnot theorem - Absolute thermodynamic temperature scale.	1
	Discussion, Activity and Tutorials	2
4	**Entropy:**	
4.1	Clausius inequality – Entropy - Definition as a thermodynamic property	1
4.2	change of entropy for solids, liquids and gases in different thermodynamic processes- T-ds relation, Principle of increase of entropy	2
4.3	Entropy Generation-Third law of thermodynamics- Thermodynamic relations-Maxwell's relations	1
4.4	Clausius-Clapeyron equation, The Joule-Thomson co-efficient.	1
	Discussion, Activity and Tutorials	2
5	**Exergy and Anergy:**	
5.1	High grade and low energy, Exergy and Anergy,	1
5.2	Availability and Irreversibility for open and closed system processes	2
5.3	II law Efficiency	1
	Discussion, Activity and Tutorials	2
6	**Gas mixture:**	
6.1	Avogadro's law, composition of gas mixture, Dalton's law of partial pressure, Amagot's law, Gibbs Theorem, property equations	1
6.2	change of properties of gas mixture	1
	Discussion, Activity and Tutorials	2
7	**Psychrometric properties, processes:**	
7.1	Psychrometric properties, Psychrometric processes- Sensible heating, Sensible cooling,	1
7.2	heating and humidification, cooling and dehumidification,	1
7.3	adiabatic mixing of two stream, bypass factor, SHF and its application in heat load calculation	2
	Discussion, Activity and Tutorials	2
	Total Periods	**40**

Course Designer(s):

S.No.	Name	Designation	Department	Email id
1.	Dr. P. Maran	Professor	Mechanical Engineering	pmmech@tce.edu
2.	Dr. B. Karthikeyan	Assistant Professor	Mechanical Engineering	bkmech@tce.edu
3.	Dr. M. S. Govardhanan	Assistant Professor	Mechanical Engineering	govardhanans@tce.edu

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26MECD0	Metal Casting, Forming, Joining and Sheet Metal Working	Category	L	T	P	Credits	TE Type
		PCC	4	-	-	4	Theory

Preamble

Manufacturing processes play a vital role in transforming raw materials into functional engineering products with desired shape, properties, and performance. This course introduces the fundamental principles and industrial practices involved in casting, metal forming, welding, and sheet metal operations. Emphasis is given to process selection, manufacturability, product quality, and defect analysis in modern manufacturing environments. The course enables students to understand and apply suitable manufacturing techniques for engineering applications.

Prerequisite

- Nil

Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain the principles, materials, and process steps involved in metal casting, metal forming, welding, and sheet metal operations.	TPS 2	------	15	SDG9	1
CO2	Select suitable casting and moulding methods for manufacturing engineering components based on process requirements.	TPS 3	1.3.1	20	SDG9	1
CO3	Choose appropriate metal forming processes, such as rolling, forging, drawing, and extrusion, for producing engineering components with the required shapes and properties.	TPS 3	1.3.1	20	SDG9	1
CO4	Recommend suitable welding and joining techniques for engineering applications based on material characteristics and service requirements.	TPS 3	1.3.1	15	SDG9	1
CO5	Suggest suitable sheet metal operations for	TPS 3	1.3.1	15	SDG9	1

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No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
	manufacturing engineering components, considering feasibility and manufacturability.					
CO6	Describe the common defects, causes, and remedial measures associated with casting, forming, welding, and sheet metal operations.	TPS 2	------	15	SDG9	1

Assessment Pattern

CO	CAT 1	Assignment 1	CAT 2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20	-	25	-	15
CO2	30	50	-	-	20
CO3	30	50	-	-	20
CO4	-	-	25	50	15
CO5	-	-	25	50	15
CO6	20	-	25	-	15
Total	**100**	**100**	**100**	**100**	**100**

Syllabus

Metal Casting Processes

Expendable Mould Casting Processes: Pattern materials, types, and allowances – Moulding sand ingredients, properties, and testing – Cores: types and functions – Sand mould preparation and green sand mould making – Shell mould casting and investment casting – Ceramic mould casting and applications

Permanent Mould Casting Processes: Gravity die casting – Pressure die casting – Centrifugal casting – Slush casting and applications

Casting Quality: Common casting defects and remedies – Non-destructive testing methods

Metal Forming Processes

Fundamentals of Metal Forming: Elastic and plastic deformation – Hot and cold working – Metal flow and strain hardening

Rolling Process: Hot and cold rolling – Rolling process parameters – Rolling mills and rolling operations – Flat and shape rolling – Defects in rolled products – Seamless pipe production

Forging Process: Open die and closed die forging – Forging operations – Forging presses and dies – Defects in forgings

Drawing Process: Wire and tube drawing – Drawing equipment and dies – Defects in drawing process

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Extrusion Process: Hot, cold, impact, and hydrostatic extrusion – Extrusion equipment and dies – Defects in extrusion

Metal Joining Processes

Welding Fundamentals: Solidification of weld metal – Heat affected zone – Weld joints – Shielding gases – Filler materials and fluxes – Types of weld joints

Fusion Welding Processes: Oxy-fuel gas welding – SMAW – SAW – MIG welding – TIG welding – Plasma arc welding – Electron beam welding – Laser beam welding

Solid State Welding Processes: Resistance spot welding – Friction welding – Friction stir welding – Diffusion bonding – Ultrasonic welding

Brazing and Soldering: Principles – Process steps – Applications

Welding Defects and Inspection: Cracks – Porosity – Incomplete penetration – Poor fusion – Undercutting and distortion – Causes and remedies – Visual inspection – Ultrasonic testing – Magnetic particle testing

Sheet Metal Operations

Cutting Operations: Blanking – Piercing – Slitting – Trimming – Cut-off operations

Forming Operations: Bending – Embossing – Curling – Deep drawing – Tube bending – Formability and drawability of sheet metals

Learning Resources

Text Book

1. Serope Kalpakjian and Steven R. Schmid, “Manufacturing Engineering and Technology”, Eigth Edition, PHI, 2024.
2. Mikell P Groover, “Fundamentals of Modern Manufacturing: Materials, Processes, and Systems”, Seventh Edition, Wiley India, 2021.

Reference Books & Web resources

1. H. S. Shan “Manufacturing Processes: Casting, Forming, and Welding” Cambridge University Press, 2017
2. Mahmood Alam, Abhishek Dwivedi, Anshuman Srivastava, and Ajay Kumar Mishra, “Metal Forming, Machining, Metal Casting, Welding and Additive Manufacturing” De Gruyter, 2025
3. https://nptel.ac.in/courses/112107239

Course Contents and Lecture Schedule

Module No.	Topics	No.of Periods
1	**Metal Casting Processes:** Expendable Mould Casting Processes:	
1.1	Pattern materials, types, and allowances	1
1.2	Moulding sand ingredients, properties, and testing – Cores: types and functions	2
1.3	Sand mould preparation and green sand mould making	1

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1.4	Shell mould casting	1
1.5	investment casting	1
1.6	Ceramic mould casting and applications	1
2	**Permanent Mould Casting Processes**	
2.1	Gravity die casting	1
2.2	Pressure die casting	1
2.3	Centrifugal casting	1
2.4	Slush casting and applications	1
3	**Casting Quality**	
3.1	Common casting defects and remedies	2
3.2	Non-destructive testing methods	1
4	**Metal Forming Processes**	
4.1	**Fundamentals of Metal Forming**: Elastic and plastic deformation	1
4.2	Hot and cold working – Metal flow and strain hardening	1
4.3	**Rolling Process**: Hot and cold rolling – Rolling process parameters	2
4.4	Rolling mills and rolling operations	1
4.5	Flat and shape rolling	1
4.6	Defects in rolled products	1
4.7	**Forging Process**: Open die and closed die forging	1
4.8	Forging operations – Forging presses and dies	1
4.9	Defects in forgings	1
4.10	**Drawing Process**: Wire and tube drawing	1
4.11	Drawing equipment and dies – Defects in drawing process	1
4.12	**Extrusion Process**: Hot, cold, impact, and hydrostatic extrusion	1
4.13	Extrusion equipment and dies – Defects in extrusion	1
5	**Metal Joining Processes**	
5.1	**Welding Fundamentals**: Solidification of weld metal – Heat affected zone – Weld joints – Shielding gases – Filler materials and fluxes – Types of weld joints	3
5.2	**Fusion Welding Processes**: Oxy-fuel gas welding – SMAW – SAW – MIG welding – TIG welding – Plasma arc welding – Electron beam welding – Laser beam welding	3
5.3	**Solid State Welding Processes**: Resistance spot welding – Friction welding – Friction stir welding – Diffusion bonding – Ultrasonic welding	3
5.4	**Brazing and Soldering**: Principles – Process steps – Applications	1

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5.5	**Welding Defects and Inspection**: Cracks – Porosity – Incomplete penetration – Poor fusion – Undercutting and distortion – Causes and remedies – Visual inspection – Ultrasonic testing – Magnetic particle testing	3
6	**Sheet Metal Operations**	
6.1	**Cutting Operations**: Blanking – Piercing – Slitting – Trimming – Cut-off operations	1
6.2	**Forming Operations**: Bending – Embossing – Curling – Deep drawing – Tube bending – Formability and drawability of sheet metals	2
	Total Periods	**46**

Course Designers

S.No.	Name	Designation	Department	Email id
1.	Dr. R. Sivasankaran	Assistant Professor	Mechanical Engineering	rssmech@tce.edu
2.	Dr. C. Selva Kumar	Assistant Professor	Mechanical Engineering	cskmech@tce.edu

22MECE0	MANUFACTURING PROCESSES LABORATORY	Category	L	T	P	Credit	TE Type
		PCC	0	0	2	1	Practical

Preamble

This course provides hands-on exposure to fundamental manufacturing processes widely used in mechanical and production industries. The laboratory enables students to develop practical skills in metal casting, welding, 3D-printing, CNC laser cutting and CNC wood cutting operations through structured experimental activities.

Prerequisite

- Nil

Course Outcomes

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

COs	Course Outcome 1 (CO1)	TCE Proficiency Scale	Performance Indicators	SDG Addressed	SDG Level
CO1	Prepare Green Sand Mould using Single Piece and Split Patterns for metal casting.	TPS 3	5.3.1	SDG 9	2
CO2	Fabricate lap, butt, corner, and T-joints using gas welding, arc welding, and MIG/TIG welding processes by selecting appropriate welding parameters, electrodes, filler materials, and shielding gases.	TPS 3	5.3.1	SDG 9	2
CO3	Operate a 3D printer to fabricate simple engineering components by selecting appropriate printing parameters and materials.	TPS 3	5.2.1	SDG 9	2
CO4	Perform CNC laser cutting operations to produce simple engineering profiles using suitable machine parameters.	TPS 3	5.2.1	SDG 9	2
CO5	Machine simple components using CNC wood cutting machine by selecting suitable cutting parameters and part programming commands.	TPS 3	5.3.1	SDG 8	2

Assessment Pattern: Cognitive Domain

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-lab, In-lab, Post-lab	75	Conducted throughout the semester
Model Test	CO-wise (Cognitive, Psychomotor, Affective)	25	Mid/End semester internal test
Total Internal Marks		**100**	
End Semester Examination	CO-wise (Cognitive, Psychomotor, Affective)	100	-

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Preparation of green sand mould using single-piece pattern	Level 1	Instrumentation, Psychomotor Skills, Safety	CO1
2	Preparation of green sand mould using split pattern	Level 1	Psychomotor Skills, Teamwork, Sensory Awareness	CO1
3	Fabrication of lap and butt joints using gas welding	Level 1	Instrumentation, Psychomotor Skills, Safety	CO2
4	Fabrication of corner and T-joints using arc welding	Level 1	Psychomotor Skills, Sensory Awareness, Safety	CO2
5	Preparation of lap and butt joints using MIG welding	Level 2	Experimentation, Instrumentation, Data Analysis	CO2
6	Preparation of corner and T-joints using TIG welding	Level 2	Experimentation, Psychomotor Skills, Safety	CO2
7	Fabrication of simple engineering component using 3D printer	Level 2	Design, Instrumentation, Creativity	CO3
8	CNC laser cutting of simple 2D profiles	Level 2	Instrumentation, Experimentation, Psychomotor Skills	CO4
9	CNC laser cutting of engraved/name plate profiles	Level 2	Creativity, Data Analysis, Instrumentation	CO4
10	CNC wood cutting operation for simple profile machining	Level 2	Psychomotor Skills, Instrumentation, Experimentation	CO5
11	CNC wood cutting operation for engraved/profile components	Level 2	Experimentation, Data Analysis, Psychomotor Skills	CO5

Course Designer(s):

S.No.	Name	Designation	Department	Email id
1.	Dr. PL. K. Palaniappan	Professor	Mechanical Engineering	kpal@tce.edu
2.	Dr. M. Karthic	Assistant Professor	Mechanical Engineering	mkmect@tce.edu
3.	Dr. R. Kamalakannan	Assistant Professor	Mechanical Engineering	rkkmech@tce.edu

26MECF0	METALLURGY AND MATERIAL TESTING LABORATORY	Category	L	T	P	Credits	TE Type
		PCC	0	0	2	1	Practical

Preamble

This laboratory course enables students to understand the microstructural characteristics and mechanical behavior of engineering materials. It covers experimental determination of elastic constants, hardness, compressive strength, fatigue, and heat treatment effects. The course emphasizes hands-on skills, analysis, and interpretation of results relevant to material selection in engineering applications.

Prerequisite

- Nil

Course Outcomes

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

COs	Course Outcome	TPS Level	PI	Objective	SDG Addressed	SDG Level
CO1	Use metallurgical microscope instrument to Identify the microstructure of given specimens	TPS 3	1.4.1	1	09	01
CO2	Apply fatigue/ Jominy end quench/ Brinell hardness test to determine fatigue properties / hardenability / hardness of the steel under different heat treatment.	TPS 3	1.4.1	3	09	01
CO3	Apply sand/ sieve analysis test to measure compressive strength/ Grain Fineness Number of molding sand	TPS 3	1.4.1	6	09	01
CO4	Apply tension/torsion/spring test to determine the elastic constants of different materials	TPS 3	1.4.1	6	09	01
CO5	Use Brinell/Rockwell hardness method to measure the hardness of engineering materials	TPS 3	1.4.1	6	09	01
CO6	Apply bending / deflection/ linear movement test to compute elastic constants	TPS 3	1.4.1	6	09	01

SDG 9: Industry, Innovation, & Infrastructure and Level 1 (Introductory)

Assessment Pattern: Cognitive Domain

Type of Assessment	Component	Marks		Remarks
		Metallurgy	Strength of materials	
Continuous Assessment	Pre-lab, In-lab, Post-lab	37.5	37.5	Conducted throughout the semester
Model Test	CO-wise	12.5	12.5	End semester internal test
	Total	50	50	Duration: 90 minutes per lab
Total Internal Marks		**100**		
End Semester Examination	CO-wise	50	50	Total Duration:3 Hours (90 minutes per lab)
Total End Semester Marks		**100**		

List of Experiments with CO Mapping

Part a: Metallurgy Lab

Sl. No.	Name of the Experiment	Level of Experiment	COs Addressed
1	Identification of microstructure of given Specimen (steel and cast iron)	Level 1	CO1
2	Determination of hardenability of steel by Jominy end quench test	Level 1	CO2
3	Determination of hardness of steel under different heat treatment techniques	Level 1	CO2
4	Determination of fatigue properties of steel using fatigue testing machine	Level 1	CO2
5	Determine the grain fineness number of the molding sand	Level 1	CO3
6	Determination of the compressive strength of molding sand	Level 1	CO3

Part B: Strength of Materials Lab

Sl. No.	Name of the Experiment	Level of Experiment	COs Addressed
1	Determination of Young's Modulus of Steel by tension test in UTM	Level 1	CO4
2	Determination of rigidity modulus by torsion test	Level 1	CO4
3	Determination of rigidity modulus of compression & tension spring by spring test	Level 1	CO4
4	Determination of Brinell hardness and Rockwell hardness for Steel/Copper/ Aluminum/Brass	Level 1	CO5
5	Determination of Young's Modulus of beam (Steel, Wood, Aluminum) by bending test/ deflection test in UTM	Level 1	CO6
6	Determination of Young's Modulus of beam using Huggen Berger Tensometer	Level 1	CO6

Course Designer(s):

S.No.	Name	Designation	Department	Email id
1.	Dr. D. Brindha	Professor	Civil Engineering	dbciv@tce.edu
2.	Mr. T. Prakash	Assistant Professor	Mechanical Engineering	tpmech@tce.edu
3.	Dr. S. Arun Kumar	Assistant Professor	Mechanical Engineering	sakmech@tce.edu

26CHSC0	CHEMISTRY LABORATORY	Category	L	T	P	Credits
		BSC	0	0	3	1.5

Preamble

This course aims to provide the students with basic practical knowledge in chemistry. The objective of this course is to develop students' intellectual and psychomotor skills by providing hands-on experience in quantitative analysis, electrochemistry, physicochemistry, photocolorimetry, and green nanomaterial synthesis techniques.

Prerequisite

NIL

Course Outcomes

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

COs	Course Outcome	TCE Proficiency Scale	Performance Indicators	SDG Addressed	SDG Level
CO1	Operate pH meters, conductivity bridges, colorimeters, potentiometric systems, and volumetric apparatus to determine physicochemical properties of engineering samples.	TPS 3	5.2.1	SDG 9 – Industry, Innovation and Infrastructure	2
CO2	Measure readings from volumetric, and instrumental methods to determine concentration of chemical and water samples.	TPS 3	4.1.2	SDG 6 – Clean Water and Sanitation	2
CO3	Demonstrate precise laboratory techniques, including pipetting, burette handling, endpoint detection, calibration, and solution preparation during quantitative chemical analysis.	TPS 3	5.3.1	SDG 4 – Quality Education	2
CO4	Apply laboratory safety procedures, chemical handling practices, and waste disposal protocols during analytical and electrochemical experiments.	TPS 3	6.4.1	SDG 12 – Responsible Consumption and Production	2
CO5	Demonstrate structured laboratory reports by interpreting observations, calculations, graphs, error analysis, and experimental conclusions using scientific documentation practices.	TPS 3	9.1.2	SDG 4 – Quality Education	2
CO6	Apply collaborative responsibilities ethically during experimentation, data recording, analysis, and laboratory discussions.	TPS 3	8.2.1	SDG 16 – Peace, Justice and Strong Institutions	2
CO7	Analyse deviations and experimental errors in titrimetric, electrochemical, and instrumental methods, and recommend	TPS 4	4.3.1	SDG 9 – Industry, Innovation and Infrastructure	2

	corrective measures to improve analytical accuracy.				
CO8	Evaluate electrochemical behaviour, corrosion characteristics, and electroplating efficiency of metallic systems using modern electrochemical techniques.	TPS 5	3.3.1	SDG 9 – Industry, Innovation and Infrastructure	2

Assessment Pattern: Cognitive Domain

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-Lab, In-Lab, and Post-Lab Activities	75	Conducted throughout the semester as per laboratory assessment framework and openness levels specified in the curriculum guidelines.
Model Test	CO-wise Assessment covering Cognitive, Psychomotor, and Affective Domains	25	Mid-semester / End-semester internal practical assessment using structured rubrics aligned with all three learning domains.
Total Internal Marks		**100**	Continuous Assessment (75) + Model Test (25).
End Semester Examination	CO-wise Assessment covering Cognitive, Psychomotor, and Affective Domains	100	Conducted as per COE regulations and curriculum requirements using structured laboratory evaluation rubrics.

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Estimation of Total Hardness of Water	Level 1	Instrumentation, Data Analysis, Psychomotor Skills	CO1, CO2, CO3, CO4, CO5
2	Estimation of Calcium in a Milk Sample	Level 1	Experimentation, Data Analysis, Psychomotor Skills	CO2, CO3, CO5, CO6
3	Estimation of Chemical Oxygen Demand in Effluent	Level 2	Experimentation, Data Analysis, Safety	CO1, CO2, CO4, CO5, CO7
4	Determination of the Surface Tension of a Liquid	Level 2	Instrumentation, Models, Psychomotor Skills	CO1, CO2, CO3, CO5
5	Estimation of Antacid in a Tablet	Level 1	Experimentation, Data Analysis,	CO2, CO3, CO5

			Psychomotor Skills	
6	Estimation of Acid Strength in Citrus Fruit	Level 1	Experimentation, Data Analysis, Psychomotor Skills	CO2, CO3, CO5, CO6
7	Determination of the Molecular Weight of a Polymer by the Ostwald Viscometer	Level 2	Models, Instrumentation, Data Analysis	CO1, CO2, CO5, CO7
8	Estimation of Acidic Impurities in Soft Drinks by the Conductometric Method	Level 2	Instrumentation, Data Analysis, Learn from Failure	CO1, CO2, CO5, CO7
9	Estimation of the pH of a Soil Sample	Level 1	Instrumentation, Psychomotor Skills, Data Analysis	CO1, CO3, CO4, CO5
10	Estimation of Fe^{2+} using the Potentiometric Method	Level 2	Instrumentation, Experimentation, Data Analysis	CO1, CO2, CO5, CO7
11	Green Synthesis of Plasmonic Silver Nanoparticles Using Plant Extract and Quantitative Analysis by Photocolorimetry	Level 2	Instrumentation, Experimentation, Data Analysis, Creativity	CO1, CO2, CO5, CO7, CO8
12	Estimation of the rate of Corrosion of a Metal Specimen by Electrochemical Method	Level2	Instrumentation, Experimentation, Data Analysis,	CO1, CO2, CO5, CO7, CO8

Course Designer(s):

Dr. V. Velkannan, Assistant Professor and Head (i/c), Chemistry velkannan@tce.edu

Dr. S. Sivailango, Assistant Professor, Chemistry drssilango@ tce.edu

Dr. M. Velayudham, Assistant Professor, Chemistry mvchem@tce.edu

Dr. A. Ramalinga Chandra Sekar, Assistant Professor, Chemistry arcchem@ tce.edu

Dr. B. Shankar, Assistant Professor, Chemistry bsrchem@ tce.edu

Dr. R. Sivakumar, Assistant Professor, Chemistry rsrchem@ tce.edu

Dr. P. Ramkumar, Assistant Professor, Chemistry prrchem@ tce.edu