CURRICULUM AND DETAILED SYLLABI

FOR

FIRST AND SECOND SEMESTER

B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

FOR THE STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2026 - 2027 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING

(A Govt. Aided, Autonomous Institution affiliated to Anna University)

MADURAI – 625 015

Phone: 0452 – 2482240,41
Fax: 0452 2483427
Web: www.tce.edu

Passed in BoS meeting 22.05.2026 Approved in 71st Academic Council meeting 27.06.2026

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI – 625 015

VISION AND MISSION OF THE DEPARTMENT

Vision:"Be a globally renowned school of engineering in Mechatronics"

Mission: As a department, we are committed to

M1: Develop ethical and competent engineers by synergizing world class teaching, learning and research

M2: Establish state-of-art laboratories and to provide consultancy services to fulfil the expectations of industry and needs of the society

M3: Inculcate entrepreneurial qualities for creating, developing and managing global engineering ventures

M4: Motivate the students to pursue higher studies and research

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

PEO 1: The programme will prepare graduates to synergistically integrate mechanical engineering with electronic and intelligent computer control in the design and manufacture of industrial products and processes.

PEO 2: The programme will prepare graduates with strong team skills to solve multi-disciplinary problems using Mechatronics approach.

PEO 3: The programme will prepare graduates with an understanding of their ethical and social responsibility.

Programme Specific Outcomes (PSO) of B.E. Mechatronics Engineering

After the successful completion of the B.E. Mechatronics Engineering degree programme, the students will be able to:

PSO1: Design, develop and retrofit conventional mechanical system into low-cost automated system using sensors and controllers

PSO2: Design, develop and analyse mechatronics system using hardware and software tools.

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

Engineering Graduates will be able to:

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 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)

PEO - Mission Mapping:

PEO's	M1	M2	M3	M4
PEO1	S	S	M	M
PEO2	S	M	S	M
PEO3	S	M	M	L

PEO - PO - PSO Mapping:

PEO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PEO1	S	S	S	M	S	M	M	L	M	M	M	M	S	S
PEO2	M	M	M	M	M	M	L	M	S	S	S	S	M	S
PEO3	L	L	M	L	-	S	S	S	M	M	L	M	M	L

PO-GA Mapping:

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11
PO1											
PO2											
PO3											
PO4											
PO5											
PO6											
PO7											
PO8											
PO9											
PO10											
PO11											

TCE PROFICIENCY SCALE (CDIO Curriculum Framework)

TPS Level	Proficiency Statement	Cognitive	Affective	Psychomotor
TPS 1	To have been exposed to	Remember	Receive	Perception / Set
TPS 2	To be able to interpret and imitate	Understand	Respond	Guided Response
TPS 3	To be skilled in practice or implementation	Apply	Value	Mechanism
TPS 4	To be able to participate in and contribute meaningfully	Analyse	Organise	Complex Overt Response
TPS 5	To be able to judge and adapt	Evaluate	**Characterize**	Adaptation
TPS 6	To be able to lead and innovate	Create	Characterize	Origination

B.E. MECHATRONICS ENGINEERING - SCHEDULING OF COURSES FOR STUDENTS JOINED FROM ACADEMIC YEAR 2026-27 ONWARDS

Sem	Theory / Theory cum Practical / Practical										CDIO Courses	Audit Courses	Credit
I	26MASA0 Applied Calculus for Engineers (BSC-4)	26PHSA0 Physics (BSC-3)	26EGHA0 Technical English (TCP) (HSMC-3)	26MTCA0 Electrical Circuits and Electronic Devices (PCC-2)				26MTEA0 Computer Aided Drafting (TCP) (ESC-3)	26MTCB0 Electrical Circuits and Electronics Devices Lab (PCC-1.5)	26PHSB0 Physics Laboratory (BSC-1.5)	26CCEA0 Introduction to Engineering (TCP) (ESC-2)	26TAAA0 Heritage of Tamil 26CCAA0 Vision and Speed Maths (AC-0)	20
II	26MTSA0 Vector Calculus and Ordinary Differential Equations (BSC-3)	26CHSA0 Engineering Chemistry (BSC-3)	26MTCC0 Manufacturing Process (PCC-2)	26MTCD0 Free Body Mechanics (PCC-3)	26MTCE0 Electronic Circuits (TCP) (PCC-3)	26MTCF0 Manufacturing Process Lab (PCC-1.5)		26MTEB0 Mechatronic Systems (TCP) (ESC-3)	26CCEB0 Biology for Engineers (ESC-3)	26CHSC0 Chemistry Laboratory (BSC-1.5)		26TAAB0 Tamil and Technology 26CCAB0 Foundations of Problem Solving-1 (AC-0)	23
III	26MTSB0 Maths-III (BSC-3)	26MTCG0 Digital Electronics (TCP) (PCC-3)	26MTCH0 Kinematics and Dynamics of Machinery (PCC-3)	26MTCJ0 Thermal Fluid Systems (PCC-3)	26MTCK0 Electrical Machines (PCC-3)	26MTCL0 Digital Signal Processing (PCC-2)	26MTCM0 Thermal Fluid Systems Lab (PCC-1)	26MTEC0 C Programming (TCP) (ESC-3)		26CCLA0 Building Communication Skills (EEC-1)	26CCEC0 Thinking (ESC-3)	26CCAC0 Constitution of India (AC-0)	25
IV	26MTSC0 Maths-IV (BSC-3)	26MTCN0 Control Systems (PCC-3)	26MTCP0 Electrical Engineering and Drawing (TCP) (PCC-3)	26MTCQ0 Industrial Hydraulics and Pneumatics (TCP) (PCC-2)	**26MECQ0** Total Productive Maintenance (TCP) (PCC-2)	26MTCR0 Computer Architecture and Microprocessor (PCC-3)	26MTCS0 Power Electronics (PCC-2)	26MTCT0 Object Oriented Programming (TCP) (PCC-3)	26MTCU0 Computer Architecture and Microprocessor lab (PCC-1)	26CCED0 Environment and Sustainability (ESC-3)	26EGHB0 Professional Communication Lab (HSMC-2)	26CCLB0 Numerical Skills and Quantitative Problem Solving (EEC-1)	26CCAD0 Indian Knowledge System (AC-0)	28
V	26CCHA0 Project Management (HSMC-3)	26MTCV0 Design of Machine Elements (PCC-3)	**26MECU0** Computer Aided Manufacturing (TCP) (PCC-3)	26MTCW0 Instrumentation and Control System (TCP) (PCC-4)	26MTCX0 Servo Motor and Drives (TCP) (PCC-2)	26MTCY0 Microcontrollers and Embedded system (PCC-2)	26MTCZ0 Microcontrollers and Embedded system lab (PCC-1)	26MTED0 Algorithm and Data Structures (ESC-3)	26CCLC0 Aptitude Skills (EEC-2)	Basic Science Elective / Language Elective (OEC-3)	26MTLA0 Project-I (EEC-3)	26CCAE0 Universal Human Values and Ethics (AC-0)	29
VI	26CCHB0 Accounting and Finance (HSMC-3)	26MTDA0 Mechatronics System Design (PCC-3)	26MTDB0 Real time system and IOT (PCC-2)		**26MEDA0** Robotic Technology (TCP) (PCC-4)	**26MEDB0** Automation (TCP) (PCC-3)	26MTDC0 Mechatronics System Integration Lab (PCC-1)	PEC-1 (PEC-3)	PEC-2 (PEC-3)	Interdisciplinary Elective (OEC-3)	26MTLB0 Project-II (EEC-3)	26CCAF0 Disaster Management (AC-0)	28
VII	PEC-3 (PEC-3)	PEC-4 (PEC-3)	PEC-5 (PEC-3)		PEC-6 (PEC-3)	PEC-7 (PEC-3)					26MTLC0 Project-III (EEC-3)		18
VIII											26MTLD0 Project-IV (EEC-3)		3
Total Credits													174

BSC	HSMC	PCC-Electronics	PCC-IT	PCC-Electrical	PCC-Mechanical	ESC	AC	PCC-BEST	PEC

Passed in BoS meeting 22.05.2026

Approved in 71st Academic Council meeting 27.06.2026

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI – 625 015
B. E. MECHATRONICS ENGINEERING DEGREE PROGRAMME
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	

List of Program Elective Courses

Vertical 1	Vertical 2	Vertical 3	Vertical 4
Sensors & Instrumentation	**Mechanical Systems**	**Robotics & Automation Systems**	**System Integration**
Industrial Communication Networks	Design and Analysis of Experiments	Drone Technology	Industry 4.0
Wireless Sensor Networks & IOT Protocols	Semiconductor Manufacturing	Autonomous mobile robots	Electric Vehicle and Energy Systems
Virtual Instrumentation	Non-Destructive Testing and Evaluation	Machine Learning and Applications	Sustainable Engineering
Edge Computing	Building Management Systems	Cognitive Robotics	Industrial Control of Motion Drives
Battery Management Systems	Quality Engineering	Flight Dynamics and Control	Devices and System Packaging
Sensor Fusion Technology	Micro Electro Mechanical Systems	Soft Computing	Industry 5.0
Bio-Mechatronics	Smart HVAC Systems	Machine Vision using Machine Learning	Smart Supply Chain Management
Printed Circuit Board Design	Additive Manufacturing	Unmanned Aerial Vehicle	Thermal Management of Electronic Systems
EV & Energy Systems	Optimization Techniques	Data Analytics for Engineers	Medical Digital Twin
			Deep Learning and Neural Networks

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015.

B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

COURSES OF STUDY (2026-2027 Batch Onwards)

I SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits (C)
			L	T	P	
THEORY						
26MASA0	Applied Calculus for Engineers	BSC	3	1	0	4
26PHSA0	Physics	BSC	3	0	0	3
26MTCA0	Electrical Circuits aand Electronics Devices	PCC	2	0	0	2
THEORY CUM PRACTICAL						
26EGHA0	Technical English	HSMC	3	0	0	3
26MTEA0	Computer Aided Drafting	ESC	2	0	2	3
PRACTICAL						
26MTCB0	Electrical Circuits aand Electronics Devices Laboratory	PCC	0	0	3	1.5
26PHSB0	Physics Laboratory	BSC	0	0	3	1.5
CDIO COURSE						
26CCEA0	Introduction to Engineering	ESC	1	0	2	2
AUDIT COURSE						
26TAAA0	Heritage of Tamil	AC	0	0	0	0
26CCAA0	Vision and Speed Maths	AC	0	0	0	0
		Total	**14**	**1**	**10**	**20**

HSMC : Humanities and Social Sciences including Management Courses
BSC : Basic Science Courses
ESC : Engineering Science Courses
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AC : Audit Course
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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015.

B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

COURSES OF STUDY (2026-2027 Batch Onwards)

II SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits (C)
			L	T	P	
THEORY						
26MTSA0	Vector Calculus and Ordinary Differential Equations	BSC	2	1	0	3
26CHSA0	Engineering Chemistry	BSC	3	0	0	3
26MTCC0	Manufacturing Process	PCC	2	0	0	2
26MTCD0	Free Body Mechanics	PCC	3	0	0	3
26CCEB0	Biology for Engineers	ESC	3	0	0	3
THEORY CUM PRACTICAL						
26MTCE0	Electronic Circuits	PCC	2	0	2	3
26MTEB0	Mechatronics Systems	ESC	2	0	2	3
PRACTICAL						
26MTCC0	Manufacturing Process Laboratory	PCC	0	0	3	1.5
26CHSC0	Chemistry Laboratory	BSC	0	0	3	1.5
AUDIT COURSE						
26TAAB0	Tamil and Technology	AC	0	0	0	0
26CCAB0	Foundations of Problem Solving - I	AC	0	0	0	0
		Total	**17**	**1**	**10**	**23**

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B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

COURSES OF STUDY (2026-2027 Batch Onwards)

III SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits (C)
			L	T	P	
THEORY						
26MTSB0	Maths -III	BSC	2	1	0	3
26MTCH0	Kinematics and Dynamics of Machincery	PCC	3	0	0	3
26MTCJ0	Thermal Fluid Systems	PCC	3	0	0	3
26MTCK0	Electrical Machines	PCC	3	0	0	3
26MTCL0	Digital Signal Processing	PCC	2	0	0	2
26CCLA0	Building Communication Skills	EEC	1	0	0	1
THEORY CUM PRACTICAL						
26MTCG0	Digital Electronics	PCC	2	0	2	3
26MTEC0	C Programming	ESC	2	0	2	3
PRACTICAL						
26MTCM0	Thermal Fluid Systems Laboratory	PCC	0	0	2	1
CDIO COURSE						
26CCEC0	Thinking	ESC	2	0	2	3
AUDIT COURSE						
26CCAC0	Constitution of India	AC	0	0	0	0
		Total	**20**	**1**	**8**	**25**

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015.

B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

COURSES OF STUDY (2026-2027 Batch Onwards)

IV SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits (C)
			L	T	P	
THEORY						
26MTSC0	Maths IV	BSC	2	1	0	3
26MTCN0	Control Systems	PCC	3	0	0	3
26MTCR0	Computer Architecture and Microprocessor	PCC	3	0	0	3
26MTCS0	Power Electronics	PCC	2	0	0	2
26CCED0	Environment and Sustainability	ESC	3	0	0	3
26CCLB0	Numerical Skills and Quantitative Problem Solving	EEC	1	0	0	1
THEORY CUM PRACTICAL						
26MTCP0	Electrical Engineering and Drawing	PCC	2	0	2	3
26MTCQ0	Industrial Hydraulics and Pneumatics	PCC	1	0	2	2
22MECQ0	Total Productive Maintenance	PCC	1	0	2	2
26MTCT0	Object Oriented Programming	PCC	2	0	2	3
PRACTICAL						
26MTCU0	Computer Architecture and Microprocessor Laboratory	PCC	0	0	2	1
26EGHB0	Professional Communication Laboratory	HSMC	1	0	2	2
AUDIT COURSE						
26CCAD0	Indian Knowledge System	AC	0	0	0	0
		Total	**21**	**1**	**12**	**28**

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B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

COURSES OF STUDY (2026-2027 Batch Onwards)

V SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits (C)
			L	T	P	
THEORY						
26CCHA0	Project Management	HSMC	3	0	0	3
26MTCV0	Design of Machine Elements	PCC	3	0	0	3
26MTCY0	Microcontrollers and Embedded System	PCC	2	0	0	2
26MTED0	Algorithms and Data Structures	ESC	3	0	0	3
26CCLC0	Aptitude Skills	EEC	2	0	0	2
26XXXX0	Basic Science Elective/Language Elective	OEC	3	0	0	3
THEORY CUM PRACTICAL						
26MTCW0	Instrumentationand Control System	PCC	2	0	4	4
26MTCX0	Servo motor and drives	PCC	1	0	2	2
26MECU0	Computer Aided Manufacturing	PCC	2	0	2	3
PRACTICAL						
26MTCZ0	Microcontrollers and Embedded System Laboratory	PCC	0	0	2	1
PROJECT						
26MTLA0	Project I	EEC	0	0	6	3
AUDIT COURSE						
26CCAE0	Universal Human Values and Ethics	AC	0	0	0	0
		Total	**21**	**0**	**16**	**29**

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015.

B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

COURSES OF STUDY (2026-2027 Batch Onwards)

VI SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	(C)
THEORY						
26CCHB0	Accounting and Finance	HSMC	3	0	0	3
26MTDA0	Mechatronics System Design	PCC	3	0	0	3
22MTDB0	Real time system and IOT	PCC	2	0	0	2
26MTPX0	Program Elective I	PEC	3	0	0	3
26MTPX0	Program Elective II	PEC	3	0	0	3
26XXXX0	Interdisciplinary Elective	OEC	3	0	0	3
THEORY CUM PRACTICAL						
26MEDA0	Robotic Technology	PCC	1	0	4	3
26MEDB0	Automation	PCC	1	0	6	4
PRACTICAL						
26MTDC0	Mechatronics System Integration Laboratory	PCC	0	0	2	1
PROJECT						
26MTLB0	Project II	EEC	0	0	6	3
AUDIT COURSE						
26CCAF0	Disaster Management	AC	0	0	0	0
		Total	**19**	**0**	**18**	**28**

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PEC :Program Elective Courses
EEC :Employment Enhancement Course
OEC :Open Elective Course
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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015.

B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

COURSES OF STUDY (2026-2027 Batch Onwards)

VII SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits (C)
			L	T	P	
THEORY						
26MTPX0	Program Elective III	PEC	3	0	0	3
26MTPX0	Program Elective IV	PEC	3	0	0	3
26MTPX0	Program Elective V	PEC	3	0	0	3
26MTPX0	Program Elective VI	PEC	3	0	0	3
26MTPX0	Program Elective VII	PEC	3	0	0	3
PROJECT						
26MTLC0	Project III	EEC	0	0	6	3
		Total	**15**	**0**	**6**	**18**

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OEC :Open Elective Course
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B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

COURSES OF STUDY (2026-2027 Batch Onwards)

VIII SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits (C)
			L	T	P	
PROJECT						
26MTLD0	Project IV	EEC	0	0	6	3
		Total	**0**	**0**	**6**	**3**

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EEC :Employment Enhancement Course
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AC : Audit Course
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T : Tutorial
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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015.
B.E. DEGREE (Mechatronics Engineering) PROGRAMME
SCHEME OF EXAMINATIONS
(For the candidates admitted from 2026 - 2027 onwards)

I SEMESTER

Course Code	Name of the Course	Duration of Terminal Exam in Hrs.	Marks			Min. Marks for Pass	
			Continuous Assessment	Terminal Exam	Max. Marks	Terminal Exam	Total
THEORY							
26MASA0	Applied Calculus for Engineers	3	40	60	100	27	50
26PHSA0	Physics	3	40	60	100	27	50
26MTCA0	Electrical Circuits aand Electronics Devices	3	40	60	100	27	50
THEORY CUM PRACTICAL							
26EGHA0	Technical English	3	50	50	100	22.5	50
26MTEA0	Computer Aided Drafting	3	50	50	100	22.5	50
26CCEA0	Introduction to Engineering	3	50	50	100	22.5	50
PRACTICAL							
26MTCB0	Electrical Circuits aand Electronics Devices Laboratory	3	60	40	100	18	50
26PHSB0	Physics Laboratory	3	60	40	100	18	50

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015.
B.E. DEGREE (Mechatronics Engineering) PROGRAMME
SCHEME OF EXAMINATIONS
(For the candidates admitted from 2026 - 2027 onwards)

II SEMESTER

Course Code	Name of the Course	Duration of Terminal Exam in Hrs.	Marks			Min. Marks for Pass	
			Continuous Assessment	Terminal Exam	Max. Marks	Terminal Exam	Total
THEORY							
26MTSA0	Vector Calculus and Ordinary Differential Equations	3	40	60	100	27	50
26CHSA0	Engineering Chemistry	3	40	60	100	27	50
26MTCC0	Manufacturing Process	3	40	60	100	27	50
26MTCD0	Free Body Mechanics	3	40	60	100	27	50
26CCEB0	Biology for Engineers	3	40	60	100	27	50
THEORY CUM PRACTICAL							
26MTCE0	Electronic Circuits	3	50	50	100	22.5	50
26MTEB0	Mechatronics Systems	3	50	50	100	22.5	50
PRACTICAL							
26MTCC0	Manufacturing Process Laboratory	3	60	40	100	18	50
26CHSC0	Chemistry Laboratory	3	60	40	100	18	50

CURRICULUM AND DETAILED SYLLABI

FOR

FIRST SEMESTER

B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

FOR THE STUDENTS ADMITTED IN 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

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	TPS3	1.2.1	17	SDG 4	0

	problems on a particle in a 1D 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.

pModule 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 explain contrast differentiation in medical scans.	Module 3 – Poynting's Theorem, CT/MRI Scan	TPS 3	1
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

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

26MTCA0	ELECTRICAL CIRCUITS AND ELECTRONIC DEVICES	Category	L	T	P	Credit	Exam Type
		PCC	2	0	0	2	Theory

1. Preamble

Electrical circuits and Electronic Devices address the fundamentals of electrical circuit analysis and semiconductor devices used in modern electronic systems. The course introduces DC and AC circuit behaviour, transient analysis, and analog electronic circuits using diodes, BJTs, and MOSFETs. It provides the theoretical foundation required for embedded systems, instrumentation, control systems, and contemporary electronic engineering applications.

2. Prerequisite

- Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Scale	Performance Indicator	CO Weightage	SDG Addressed	SDG Level
CO1	Describe DC circuit analysis techniques and network theorems used in electrical circuits.	TPS 2	1.3.1, 2.1.1, 1.1.1	15%	SDG 4	2
CO2	Solve electrical circuits using node analysis, mesh analysis, and network theorems.	TPS 3	1.1.1, 2.4.1, 1.3.1	20%	SDG 4	3
CO3	Interpret AC circuit behaviour, transient response, and frequency-domain characteristics of linear circuits.	TPS 2	1.1.1, 1.3.1, 2.1.1	15%	SDG 7	2
CO4	Analyze RL, RC, and RLC circuits using transient and frequency response methods.	TPS 3	2.4.1, 1.1.1, 1.3.1	20%	SDG 9	3
CO5	Describe semiconductor devices and their operating characteristics.	TPS 2	1.2.1, 1.4.1, 2.1.1	10%	SDG 7	2
CO6	Implement basic electronic circuits using diodes, BJTs, and MOSFETs.	TPS 3	1.4.1, 5.2.1, 2.4.1	20%	SDG 9	3

4. Assessment Pattern

CO	TPS Level	CAT 1 (%)	Assignment 1 (%)	CAT 2 (%)	Assignment 2 (%)	Terminal Examination (%)
CO1	TPS 2	40	40	-	-	20
CO2	TPS 3	30	30	-	-	15
CO3	TPS 2	30	30	-	-	15
CO4	TPS 3	-	-	40	40	15
CO5	TPS 2	-	-	30	30	15
CO6	TPS 3	-	-	30	30	20

5. Syllabus

Module 1 – DC Circuit Fundamentals (CO1)
Ohm's law, Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), node analysis, mesh analysis, and source transformation, Applications.

Module 2 – Network Theorems (CO2)
Superposition theorem, Thevenin's theorem, Norton's theorem, reciprocity theorem, maximum power transfer theorem, and wye-delta transformation.

Module 3 – AC Circuit Analysis (CO3)
Sinusoidal waveforms, phasors, complex impedance, AC analysis of RL, RC, and RLC circuits, complex power, and power factor.

Module 4 – Transient and Frequency Response Analysis (CO4)
Transient response of RL, RC, and RLC circuits, differential equation modelling, Time domain and Frequency domain conversion,resonance, bandwidth, quality factor, and bode plots.

Module 5 – Semiconductor Devices (CO5)
Intrinsic and extrinsic semiconductors, PN junction diode, Zener diode, LED, photodiode, solar cell, BJT characteristics, and MOSFET characteristics, Applications.

Module 6 – Power and Switching Electronic Devices (CO6)
Rectifiers, transistor biasing, BJT and MOSFET as switches, DIAC, TRIAC, SCR, UJT, and basic electronic switching circuits, Applications.

6. Learning Resources

6.1 Textbook

1. R. L. Boylestad and B. A. Olivari, *Introductory Circuit Analysis*, 14th Global Edition. Harlow, England: Pearson Education Limited, 2023, ISBN: 978-1292720302.
2. Robert L. Boylestad and Brian A. Olivari, *Electronic Devices and Circuit Theory*, 14th Edition, Pearson Education, 2015. ISBN-13: 9780137631438.

6.2 Reference Books & Web resources

1. Thomas C. Hayes and Paul Horowitz, *Learning the Art of Electronics: A Hands-On Lab Course*, Cambridge University Press, 2016. ISBN-13: 9780521177238.
2. Windell Oskay and Eric Schlaepfer, *Open Circuits: The Inner Beauty of Electronic Components*, No Starch Press, 2022. ISBN-13: 9781718502345.
3. Paul Scherz and Simon Monk, *Practical Electronics for Inventors*, 4th Edition, McGraw-Hill Education, 2016. ISBN-13: 9781259587542. The 4th Edition remains the latest available edition.
4. Charles K. Alexander and Matthew N. O. Sadiku, *Fundamentals of Electric Circuits*, 7th Edition, McGraw Hill, 2021. ISBN-13: 9781260547832.
5. Sedra and Smith, *Microelectronic Circuits*, 8th Edition, Oxford University Press, 2020. ISBN-13: 9780190853464.
6. NPTEL – *Basic Electronics*, Prof. M. B. Patil, IIT Bombay. https://nptel.ac.in/courses/108101091.
7. NPTEL – Analog Circuits through SPICE Simulation: https://nptel.ac.in/courses/117105147

7. Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcomes
Module 1 – DC Circuit Fundamentals			
1.1	Ohm's law and basic electrical circuits	1	CO1
1.2	Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL)	1	CO1

1.3	Node analysis	1	CO1
1.4	Mesh analysis and source transformation, Applications	1	CO1
Module 2 – Network Theorems			
2.1	Superposition theorem	1	CO2
2.2	Thevenin's theorem	1	CO2
2.3	Norton's theorem and reciprocity theorem	1	CO2
2.4	Maximum power transfer theorem and wye-delta transformation	1	CO2
Module 3 – AC Circuit Analysis			
3.1	Sinusoidal waveforms and phasors	1	CO3
3.2	Complex impedance and AC circuit analysis	1	CO3
3.3	RL, RC, and RLC AC circuits	1	CO3
3.4	Complex power and power factor	1	CO3
Module 4 – Transient and Frequency Response Analysis			
4.1	Transient response of RL circuits	1	CO4
4.2	Transient response of RC and RLC circuits	1	CO4
4.3	Differential equation modelling, Time domain and Frequency domain conversion	1	CO4
4.4	Resonance, bandwidth, quality factor, and bode plots	1	CO4
Module 5 – Semiconductor Devices			
5.1	Intrinsic and extrinsic semiconductors	1	CO5
5.2	PN junction diode and Zener diode	1	CO5
5.3	LED, photodiode, and solar cell	1	CO5
5.4	BJT and MOSFET characteristics, Applications.	1	CO5
Module 6 – Power and Switching Electronic Devices			
6.1	Rectifiers and transistor biasing	1	CO6
6.2	BJT as a switch and MOSFET as a switch	1	CO6
6.3	SCR, DIAC, and TRIAC	1	CO6
6.4	UJT and basic electronic switching circuits, Applications.	1	CO6
	Total Hours	**24**	

8.Course Designer(s):

Sl. No.	Name & Designation &Department	Email ID
1	Mr. S. Parthasarathi, Assistant Professor, Department of Mechatronics Engineering.	Parthasarathi_s@tce.edu
2	Dr. M. M. Devarajan, Assistant Professor, Department of Mechatronics Engineering.	mmdmech@tce.edu
3	Dr. S. A. R. Sheik Masthan, Assistant Professor, Department of Mechatronics Engineering	sarsmech@tce.edu
4	Mrs. D. Suriyakumari, Assistant Professor Department of Mechatronics Engineering	dskmect@tce.edu

		Category	L	T	P	Credit	Exam Type
26MTEA0	**COMPUTER AIDED DRAFTING**	**ESC**	**2**	**0**	**2**	**3**	**TCP-P**

Preamble

This course is designed to provide fundamental knowledge in engineering graphics and modern CAD-based modelling techniques. The course integrates manual drafting concepts with digital drafting and 3D modelling using AutoCAD and Fusion 360. Students develop spatial visualization skills through fabrication of solid models, orthographic and isometric projections, and perspective drawings, progressing to professional 2D and 3D CAD workflows. The curriculum bridges traditional drawing board practice with industry-standard digital tools, equipping students with both conceptual understanding and practical competence in engineering representation.

Prerequisite

1. 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	Fabricate simple Solids with cutting section on lateral Surfaces	TPS 3	1.4.1	10%	SDG 4	2
CO2	Convert Isometric view into Orthographic projections and vice-versa using mini drafter	TPS 3	1.4.1, 2.1.1	15%	SDG 4	2
CO3	Draw perspective projection of solids using visual ray method	TPS 3	1.4.1, 2.1.1	15%	SDG 4	2
CO4	Develop 2D drawing of components using CAD Software	TPS 3	1.5.1, 5.2.1	20%	SDG 9	2
CO5	Create 3D parametric models for components using CAD Software	TPS 3	1.5.1, 5.2.1	20%	SDG 9	2
CO6	Interpret industrial engineering drawings of components using standard drafting practices and CAD tools.	TPS 3	1.5.1, 5.2.1	20%	SDG 9	2

Assessment Pattern

CO	Theory	Practical		Terminal Exam - Practical
	CAT1 Drawing	Observation Cum Record	Model Test CO-wise	
	% of Marks	% of Marks	% of Marks	% of Marks
CO1	-	10	-	-
CO2	50	15	-	-
CO3	50	15	-	-
CO4	-	20	30	30
CO5		20	40	40
CO6		20	30	30
Total	100	100	100	100

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	25	CO4 to CO6 with Rubrics
Total Internal Marks		**100**	
End Semester Examination	CO-wise	100	Rubrics covering all Domains of learning

Syllabus

Module1:
Engineering Graphics Fundamentals - Geometric solids - Lateral surfaces - Cutting planes - Sectional views of solids - Fabrication of simple solid models - Development of sectioned solids.

Module 2:
Conversion of isometric projections into orthographic projections - Conversion of orthographic views into isometric views

Module 3:
Perspective projection of simple solids - Visual ray method - Mini drafter-based projection drawing.

Module 4:
AutoCAD interface - Drawing commands - Modify commands - Layers and annotation tools - Dimensioning - Hatching - Plotting and printing of 2D engineering drawings.

Module 5:
CAD sketching - Constraints and dimensions – Extrude - Revolve - Sweep - Loft - Rendering - Creation of basic solid models – Assembly drawing of simple products

Module 6:
Industrial engineering drawing standards - Reading and interpretation of machine component drawings -tolerances and surface finish symbols - Assembly and detailed drawings - CAD-based drafting and documentation techniques.

Text Book

1. Kevin Michael Land, “Improving CAD Designs with Autodesk Fusion 360”, Packt Publishing, Birmingham, 2024.
2. Bhatt N.D., Panchal V.M. and Ingle P.R., “Engineering Drawing”, Charotar Publishing House.(2014)

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. CADArtifex, “Autodesk Fusion 360: A Power Guide for Beginners and Intermediate Users”, CADArtifex Publications, 2026.

SDG Alignment

Activities aligned with SDGs addressed:

1. SDG 4 – Quality Education: Hands-on fabrication of solid models, projection drawing exercises, and structured CAD-based learning activities that promote engineering visualization and technical literacy.

2. SDG 9 – Industry, Innovation and Infrastructure: Application of industry-standard CAD tools (AutoCAD and Fusion 360) for 2D drafting, 3D parametric modelling, and mechanical component documentation aligned with professional engineering practice.

Course Contents and Lecture Schedule

Module No	Topics	No of Periods	**Course Outcomes**
1	Engineering Graphics - Fundamentals - Geometric solids - Lateral surfaces - Cutting planes - Sectional views of solids - Fabrication of simple solid models - Development of sectioned solids	8	CO1
2	Isometric to orthographic conversion, orthographic to isometric conversion	8	CO2
3	Perspective projection by visual ray method	8	CO3
4	CAD interface, drawing and modify commands, layers, dimensioning, hatching, plotting	8	CO4
5	CAD sketching, constraints, extrude, revolve, sweep, loft, rendering, 3D assembly - Flange Coupling, Pulley and Shaft, and Nut-Bolt Assemblies - Mass Evaluation for different materials	8	CO5
6	Industrial Drawing interpretation, Bill of Material, Drafting views from 3D models, CAD documentation	8	CO6
	Total Periods	48	

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Fabrication of cube and prism models with sectional cutting	Basic	Understand geometric solids and sectional surfaces	CO1
2	Fabrication of pyramid and cylinder models with cutting planes	Basic	Visualize sectioned views of solids	CO1
3	Conversion of isometric views into orthographic projections	Intermediate	Interpret and convert engineering views accurately	CO2
4	Conversion of orthographic views into isometric projections	Intermediate	Develop visualization and drafting skills	CO2
5	Perspective projection of solids using visual ray method	Intermediate	Apply visual ray method in engineering graphics	CO3
6	CAD Software drawing setup and coordinate system practice	Intermediate	Familiarize with CAD drafting environment	CO4
7	2D drafting of simple mechanical components using CAD Software	Intermediate	Develop CAD-based 2D drafting skills	CO4
8	Dimensioning, hatching and plotting in CAD Software	Intermediate	Apply engineering drawing standards in CAD	CO4
9	Sketch creation and parametric modelling in CAD Software	Advanced	Create parametric sketches and profiles	CO5
10	3D modelling of basic solid components using CAD software	Advanced	Develop 3D solid modelling skills	CO5
11	Interpret Industrial drawing and approach Standards followed in drawing	Advanced	Prepare drafting views from CAD models	CO6
12	Interpret Industrial drawing and identify Bill of Material	Advanced	Create detailed mechanical drawings using CAD	CO6

Course Designer(s):

Sl. No.	Name & Designation &Department	Email ID
1	Dr. G. Kumaraguruparan, Professor and Head, Mechatronics Engineering.	gkgmech@tce.edu
2	Dr. M. M. Devarajan, Assistant Professor, Department of Mechatronics Engineering.	mmdmech@tce.edu
3	Mr. M. Karuppaiah Rajkumar, Assistant Professor, Mechatronics Engineering	mkrmect@tce.edu

		Category	L	T	P	Credit	Exam Type
26MTCB0	**ELECTRICAL CIRCUITS AND ELECTRONIC DEVICES LABORATORY**	**PCC**	**0**	**0**	**3**	**1.5**	**Practical**

Preamble

Electronic Devices and Circuits Laboratory provides practical exposure to electrical circuit analysis and semiconductor device characteristics through simulation and hardware implementation. The course enables students to verify circuit laws, analyse transient responses, study semiconductor devices, and implement switching circuits using BJTs, MOSFETs, and power electronic devices. It strengthens experimental skills, waveform interpretation, and engineering troubleshooting techniques required for modern electronic system development.

Prerequisite

- NIL

Course Outcomes

No.	Course Outcome	TCE Proficiency Scale	Performance Indicator	CO Weightage	SDG Addressed	SDG Level
CO1	Verify DC circuit laws and basic electrical circuit behaviour through simulation and experimentation.	TPS 3	1.1.1, 2.4.1, 5.2.1	15%	SDG 4	2
CO2	Implement and validate network theorems using simulation and hardware circuits.	TPS 3	1.3.1, 2.4.1, 5.2.1	15%	SDG 4	2
CO3	Analyse transient and AC responses of RL, RC, and RLC circuits.	TPS 4	1.1.1, 2.4.1, 4.1.1	20%	SDG 7	2
CO4	Examine frequency response and resonance characteristics of electrical circuits.	TPS 4	1.3.1, 2.4.1, 4.1.1	15%	SDG 9	2
CO5	Analyse the characteristics of semiconductor devices through practical measurements.	TPS 3	1.4.1, 2.4.1, 5.2.1	15%	SDG 7	2
CO6	Implement switching and power electronic circuits using semiconductor devices.	TPS 3	1.4.1, 5.2.1, 2.4.1	20%	SDG 9	2
			Total	**100%**		

Assessment Pattern

CO	OCR (% of Marks)	Model Test CO-wise (% of Marks)	Terminal Exam (% of Marks)
CO1	20	50	50
CO2	20		
CO3	15		
CO4	15	50	50
CO5	15		
CO6	15		
Total	**100**	**100**	**100**

Assessment Pattern: Practical Component

Type of Assessment	Component	Marks	Remarks
OCR	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

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Verification of KCL and KVL using hardware and LTspice	Level 1	Verify Kirchhoff's laws using circuit simulation.	CO1
2	Node and Mesh Analysis using hardware and LTspice	Level 1	Analyse electrical circuits using node and mesh analysis techniques.	CO1
3	Verification of Superposition, Thevenin's, and Norton's Theorems using hardware and LTspice	Level 1	Validate network theorems using simulation tools.	CO2
4	Transient Analysis of RL and RC Circuits	Level 1	Analyse transient responses and time constants of dynamic circuits.	CO3
5	Resonance Analysis of RLC Circuits using hardware and LTspice	Level 1	Examine resonance characteristics and frequency response.	CO4
6	AC Circuit and Phasor Analysis using hardware and LTspice	Level 1	Analyse AC circuit behaviour and phasor relationships.	CO3
7	Measurement of RC and RL Time Constants	Level 2	Measure charging and discharging characteristics of RC and RL circuits.	CO3
8	Resonance Characteristics of RLC Circuit	Level 2	Determine resonance frequency, bandwidth, and quality factor.	CO4
9	Characteristics of PN Junction Diode, Zener Diode, and LED	Level 2	Analyse semiconductor diode characteristics.	CO5
10	BJT as a Switch	Level 2	Implement transistor switching circuits using BJT.	CO6

11	MOSFET as a Switch	Level 2	Implement MOSFET-based switching circuits.	CO6
12	SCR, DIAC, and TRIAC Characteristics	Level 2	Analyse the characteristics of power electronic switching devices.	CO6

Course Designer(s):

Sl. No.	Name	Designation	Department	Email ID
1	Mr. S. Parthasarathi, Assistant Professor, Department of Mechatronics Engineering.			Parthasarathi_s@tce.edu
2	Dr. M. M. Devarajan, Assistant Professor, Department of Mechatronics Engineering.			mmdmech@tce.edu
3	Dr. S. A. R. Sheik Masthan, Assistant Professor, Department of Mechatronics Engineering			sarsmech@tce.edu
4	Mrs. D. Suriyakumari, Assistant Professor Department of Mechatronics Engineering			dskmect@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

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

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

CURRICULUM AND DETAILED SYLLABI

FOR

SECOND SEMESTER

B.E. MECHATRONICS ENGINEERING DEGREE PROGRAMME

FOR THE STUDENTS ADMITTED IN 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

		Category	L	T	P	Credit	Exam Type
26MTSA0	**VECTOR CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS**	**BSC**	**2**	**1**	**0**	**3**	**Theory**

1. Preamble

Vector Calculus and Ordinary Differential Equations introduces mathematical techniques essential for mechatronics engineering applications. It covers matrix methods, vector calculus, differential equations, and numerical techniques used in modeling, analysis, and simulation of engineering systems. The course helps students develop analytical and computational skills required for control systems, robotics, automation, and interdisciplinary engineering problems.

2. Prerequisite:

- Nil

3. Course Outcomes

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Apply eigenvalue and eigenvector techniques to diagonalize matrices and analyze quadratic forms.	TPS3	1.1.1	17%	SDG4	2
CO2	Compute gradient, directional derivative, divergence and curl in scalar and vector fields.	TPS3	1.1.1	13%	SDG4	2
CO3	Apply integral theorems to evaluate line, surface, and triple integrals in engineering applications.	TPS3	1.1.1	20%	SDG4	2
CO4	Solve second-order homogeneous ordinary differential equations with constant coefficients and Euler–Cauchy equations.	TPS3	1.1.1	17%	SDG4	2
CO5	Utilize method of variation of parameters to solve non-homogeneous ordinary differential equations.	TPS3	1.1.1	13%	SDG4	2
CO6	Use numerical methods such as Taylor, Euler, Runge-Kutta and predictor-corrector methods to solve ordinary differential equations.	TPS3	1.1.1	20%	SDG4	2

4. Assessment Pattern

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

5. Syllabus

MATRIX EIGEN VALUE PROBLEMS

The Matrix eigen value Problem - Determining Eigen values and Eigen vectors - Eigen bases – Diagonalization - Quadratic forms. Applications.

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. Applications.

ORDINARY DIFFERENTIAL EQUATIONS

Homogeneous Linear ODEs of second order – Homogeneous Linear ODEs with constant coefficients – Euler-Cauchy Equations – Non homogeneous ODE: Solution by Variation of Parameters. Applications.

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Taylor's Series Method - Euler's method –Modified Euler's method – Runge's method- Runge-Kutta method– Predictor corrector methods – Milne's Method - Adams-Bashforth Method. Applications.

6. Learning Resources

6.1 Text Book

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley, 2025.
   Matrix eigen value problems: 8.1, 8.4
   Vector Calculus: 9.7, 9.8, 9.9, 10.1, 10.4, 10.6, 10.7, 10.9
   Ordinary Differential equations: 2.1, 2.2, 2.5, 2.10
2. B. S. Grewal, "Numerical Methods in Engineering and Science, C, C++ and Matlab", Mercury Learning and Information, 3/E, 2019.

Numerical Solution of ODE: 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 10.10

6.2 Reference Books & Web resources

1. Steven J. Leon, Lisette G.de Pillis, "Linear Algebra with Applications", 10th edition, Pearson Education limited 2021.

2. B.S. Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi, 2014.

3. Richard L Burden and Douglas J Faires, "Numerical Analysis", Thomas Learning, New York, 2017.

4. https://nptel.ac.in/courses/111107063
5. https://nptel.ac.in/courses/111106100
6. https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_ma33

7.Course Contents and Lecture Schedule

Module No.	Topics	No. of Periods
	Matrix Eigen Value Problems	
1.1	The Matrix Eigen value Problem	1
1.2	Determining Eigen values and Eigen vectors	1
	Tutorial	1
1.3	Eigen bases	1
1.4	Diagonalization	1
	Tutorial	1
	Vector Calculus	
2.1	Gradient of a Scalar Field	1
2.2	Directional Derivative	1
	Tutorial	1
2.3	Divergence and Curl of a Vector Field	1
2.4	Line Integrals	1
	Tutorial	1
2.5	Green's Theorem in the plane	1
2.6	Surface Integrals	1
	Tutorial	1
2.7	Triple Integrals: Divergence Theorem of Gauss	1
2.8	Stokes's Theorem	1
	Tutorial	1
	Ordinary Differential Equations	
3.1	Homogeneous Linear ODEs of Second Order	1
3.2	Homogeneous Linear ODEs with Constant Coefficients	1
	Tutorial	1
3.3	Euler-Cauchy Equations	1
	Tutorial	1
3.4	Non homogeneous ODE: Solution by Variation of Parameters	2
	Tutorial	1
	Numerical Solution of Ordinary Differential Equations	
4.1	Taylor's Series Method	1
4.2	Euler's method	1
4.3	Modified Euler's method	1
	Tutorial	1
4.4	Runge's method and Runge-Kutta method	1
4.5	Predictor-Corrector methods	1
	Tutorial	1
4.6	Milne's Method	1
4.7	Adams-Bashforth Method	1
	Tutorial	1
	Total	**36**

8.Course Designer(s):

1. Dr. S. Saravanakumar, Assistant Professor, Dept. of Mathematics, sskmat@tce.edu
2. Dr. P. Balamanikandan, Assistant Professor, Dept. of Mathematics, pbmmat@tce.edu
3. Dr. P. Jeyadurga, Assistant Professor, Dept. of Mathematics, pjdmat@tce.edu

		Category	L	T	P	Credit
26CHSA0	**ENGINEERING CHEMISTRY**	**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):

1. Dr. M. Kottaisamy, Professor, Chemistry, mmksami@tce.edu
2. Dr. S. Sivailango, Assistant Professor, Chemistry drssilango@tce.edu
3. Dr. A. Ramalinga Chandra Sekar, Assistant Professor, Chemistry arcchem@tce.edu
4. Dr. A.J. Sunija, Assistant Professor, Chemistry ajschem@tce.edu
5. Dr. R. Raj Kumar, Assistant Professor, Chemistry, rkrchem@tce.edu

26MTCC0	MANUFACTURING PROCESS	Category	L	T	P	Credit	Exam Type
		PCC	2	0	0	2	Theory

Preamble

Manufacturing processes are primarily carried out through casting, forming, machining, and joining operations. This course is designed to provide students with fundamental knowledge of these manufacturing processes, including their working principles, basic operations, equipment used, and industrial applications. It also aims to develop an understanding of process capabilities, advantages, limitations, and practical aspects involved in modern manufacturing practices.

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	Explain the principle, process capabilities of metal casting, joining and machining processes.	TPS 2	1.1.1	15%	SDG 9	Level 1
CO2	Select the suitable metal casting processes for the given product.	TPS 3	2.1.2	15%	SDG 9	Level 1
CO3	Suggest the suitable joining methods for assembly of product.	TPS 3	3.1.2	20%	SDG 9	Level 2
C04	Select a suitable process for machining of a given part.	TPS 3	4.1.2	20%	SDG 9	Level 2
CO5	Select a suitable process for the given manufacturing applications.	TPS 3	5.1.1	15%	SDG 12	Level 3
CO6	Apply additive manufacturing principles to select suitable processes for engineering applications.	TPS 3	6.4.1	15%	SDG 9	Level 3

Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20	20	-	-	10
CO2	40	40	-	-	18
CO3	40	40	-	-	18
CO4	-	-	35	35	18
CO5	-	-	35	35	18
CO6	-	-	30	30	18
Total	100	100	100	100	100

Syllabus

Introduction: Manufacturing Processes- Classification of Manufacturing Processes- Metal Casting - Machining Processes- Metal Joining Processes- Metal Finishing Processes.

Module1:

Casting processes - Pattern types - Moulding materials - Sand mould preparation - Single piece and split patterns - Core making - Melting and pouring operations - Defects in casting and remedies.

Module 2:

Fusion Welding Processes- Oxy Acetylene welding- Arc welding principles - Butt joint and lap joint preparation - Spot welding - Welding electrodes and parameters - Welding defects and safety precautions.

Module 3:

Centre lathe operations - Lathe parts and specifications - Facing - Plain turning - Step turning - Taper turning - Thread cutting - Knurling and machining parameters.

Module 4:

Drilling and milling processes - Drilling machine operations - Reamer - Types of Reamer tools and tapping - Milling machine operations - Plain milling - Slot milling - Keyway milling - Cutting tools and machining parameters.

Module 5:

Grinding processes - Surface grinding - Cylindrical grinding - Abrasive wheels and bonding materials - Surface finishing operations - Grinding parameters and applications.

Module 6:

Introduction to additive manufacturing - Types of additive manufacturing processes - CAD model preparation - Slicing process - 3D printing workflow - Materials used in additive manufacturing - Applications of additive manufacturing.

Text Book

1. Serope Kalpakjian and Steven R. Schmid, “Manufacturing Engineering and Technology”, Pearson Education, 7th Edition, 2018.
2. Mikell P. Groover, “Fundamentals of Modern Manufacturing: Materials, Processes and Systems”, John Wiley & Sons, 7th Edition, 2023.

Reference Books & web resources

1. P.N. Rao, “Manufacturing Technology”, McGraw Hill Education, 5th Edition, 2023.
2. R.K. Jain, “Production Technology”, Khanna Publishers, New Delhi, 2022.
3. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S., “Elements of Workshop Technology – Vol I & II”, Media Promoters and Publishers Pvt. Ltd., Mumbai, 2021.
4. Roy A. Lindberg, “Processes and Materials of Manufacture”, Pearson Education, 5th ..

Course Contents and Lecture Schedule

Module No	Topics	No of Periods
1	**Manufacturing Processes**	
1.1	Classification of Manufacturing Processes- Metal Casting- Metal forming- Machining Processes- Metal Joining Processes- Metal Finishing Processes	2
1.2	**Metal casting Processes** Expendable mould Casting Processes -Sand Casting Shell molding – Plaster Mould casting	2
1.3	Ceramic mould casting – Investment casting Permanent Mould casting Processes – Slush casting Pressure casting – Die casting – Centrifugal casting	2
2	**Metal Joining Processes**	
2.1	Fusion Welding Processes-Oxy Acetylene welding	2
2.2	Arc welding processes: Consumable Electrode and Non consumable Electrode - Introduction to Brazing and Soldering	2
3	**Machining processes on lathe**	
3.1	Centre lathe operations - Lathe parts and specifications	2
3.2	Facing - Plain turning - Step turning - Taper turning - Thread cutting - Knurling and machining parameters	2
4	**Machining processes on Drilling and milling machines**	
4.1	Drilling machine operations	1
4.2	Drilling machine operations - Reaming, Reaming tools and tapping - Milling machine operations - Plain milling - Slot milling - Keyway milling - Cutting tools and machining parameters.	2
5	**Machining processes onGrinding machines**	
5.1	Grinding processes - Surface grinding - Cylindrical grinding - Abrasive wheels and bonding materials	2
5.2	Surface finishing operations - Grinding parameters and applications.	1
6	**Introduction to additive manufacturing**	
6.1	Types of additive manufacturing processes	2
6.2	Materials used in additive manufacturing - Applications of additive manufacturing – Selection of additive manufacturing for a component in engineering application.	2
	Total Periods	**24**

Course Designer(s):

1. Mr.S.Rajkumar, Assistant Professor, Mechatronics srmech@tce.edu

2. Mr. M. KaruppaiahRajkumar, Assistant Professor, Mechatronics Engineering mkrmect@tce.edu

		Category	L	T	P	Credit	Exam Type
26MTCD0	**FREE BODY MECHANICS**	**PCC**	**3**	**0**	**0**	**3**	**Theory**

1. Preamble

Mechanics is the branch of physics concerned with the behavior of physical bodies when subjected to forces or displacements, and the subsequent effect of the bodies on their environment. The course addresses the modeling and analysis of static equilibrium problems with an emphasis on real world engineering applications and problem solving. For an engineer the knowledge of engineering mechanics is very essential. It helps an engineer in planning, designing, and construction of various types of structures and machines. If an engineer study engineering mechanics in systematic and scientific manner than he can take up his job more skillfully. The course covers a basic introduction to both statics and dynamics. Emphasis is placed upon the gaining of real understanding of the laws and principles of mechanics.

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	Understand the laws and principles of mechanics	TPS2	1.1.1	10	SDG 4	Level 1
CO2	Analyse and solve simple problems using the concept of static equilibrium	TPS3	2.1.2	15	SDG 4	Level 1
CO3	Find the centroid and moment of inertia of a 2D and 3D components	TPS3	..3.1.2	20	SDG 9	Level 2
CO4	Solve problems involving frictional phenomena in machines	TPS3	4.1.2	20	SDG 9	Level 2
CO5	Solve problems involving kinematics and kinetics of rigid bodies in plane motion	TPS3	5.1.1	20	SDG 9	Level 3
CO6	Solve problems using D’Alembertz principles	TPS3	6.4.1	15	SDG 9	Level 3

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	10	30	-	-	4
CO2	45	35	-	-	20
CO3	45	35	-	-	20
CO4	-	-	10	30	20
CO5	-	-	45	35	20
CO6	-	-	45	35	16
Total	100	100	100	100	100

5. Syllabus

Module1:

Static Equilibrium of Mechanical Systems:

Equilibrium Conditions-Two force body-Three force body.

Module 2:**System of forces:**

Representation of Force, Moment and Couples-Reduction of system of forces to one force and couple.

Module 3:**Distributed forces:**

Centroid of lines and areas-Centre of gravity of mass-Moment of inertia of areas-Mass moment of inertia

Module 4:**Objects with friction**:

Ladder friction-Wedge Friction-Screw Friction-Applications

Module 5: **Dynamic equilibrium**:

Particles in motion-Kinematics of particles-rectilinear motionCurvilinear Motion-Kinetics of particles-Newton's Law of motion-Work-energy principleImpulse-Momentum principle, D'Alembert's principle.

Module 6:Rigid body motion:

Kinematic Motion -Rotary motion of rigid bodies-Plane Motion-Kinetic motion.

6. Learning Resources

6.1 Text Book

1. Beer F.P. and Johnston Jr. E.R., Vector Mechanics for Engineers: Statics and Dynamics, Twelfth student Edition, Tata McGraw Hill College, 2018
2. Hibbeler R.C., Engineering Mechanics – Statics & Dynamics, Fourteenth Edition, Pearson Publisher, 2015

6.2 Reference Books&Web resources

1. R.C Hibbeler, Irving H Shames, D.P Sharma., Engineering Mechanics, Pearson Education 2011
2. Tayal A.K., Engineering Mechanics, Fourteenth Edition, Umesh Publications, 2010
3. https://nptel.ac.in/courses/112103108

7. Course Contents and Lecture Schedule

Module No	Topics	No of Periods
1	Introduction Static Equilibrium of mechanical systems	2
1.1	Fundamental laws, Free body diagram	1
1.2	Two force body, three force body	1
2	**System of forces**	
2.1	Representation of Force	1
2.2	Moment and Couples	1
2.3	Reduction of system of forces to one force and couple	1
3	**Distributed forces**	
3.1	Centroid of lines and areas	1
3.2	Centre of gravity of mass	2
3.3	Moment of inertia of areas	1
3.4	Tutorial Problems in Moment of Inertia	2
4	**Objects with friction**	
4.1	Ladder friction	2
4.2	Wedge friction	1
4.3	Screw friction	2
4.4	**Dynamic equilibrium**	
4.5	Particles in motion	1
4.6	Kinematics of particles	1
4.7	Rectilinear motion	1
4.8	Curvilinear motion	1
4.9	Kinetics of particles	1
4.10	Newton’s Law of motion	2
4.11	Work-energy principle	2
4.12	Impulse-Momentum principle,	2
4.13	Tutorial Problems	1
5	**Rigid body motion**	
5.1	General plane motion	1
5.2	Kinematic Motion –Rotary motion of Rigid bodies	1
5.3	Plane motion -D Alembert’s principle	1
5.4	Kinetic motion	1
5.5	Tutorial Problems	2
	Total Periods	**36**

8.Course Designer(s):

1. Dr. G. Kanagaraj, Professor, Mechatronics Engineering gkmech@tce.edu

2. Mr. M. Karuppaiah Rajkumar, Assistant Professor, Mechatronics Engineering mkrmect@tce.edu

		Category	L	T	P	Credit	Exam Type
26MTCE0	**ELECTRONIC CIRCUITS**	**PCC**	**2**	**0**	**2**	**3**	**TCP-P**

1. Preamble

Electronic Circuits introduces the principles and applications of analog electronic systems using diodes, BJTs, MOSFETs, and operational amplifiers. The course integrates theoretical analysis with simulation and hardware implementation of amplifier circuits, filters, oscillators, and signal conditioning systems. It develops foundational knowledge in analog circuit design, waveform analysis, feedback systems, and practical electronic circuit implementation required for modern electronic and embedded applications.

2. Prerequisite

1. Electrical Devices and circuits

3. Course Outcomes

No.	Course Outcome	TCE Proficiency Scale	Performance Indicator	CO Weightage	SDG Addressed	SDG Level
CO1	Develop diode circuits, clipping circuits, clamping circuits, rectifiers, and regulated power supplies used in analog electronic systems.	TPS 3	1.1.1, 1.4.1, 2.1.1	15%	SDG 4	1
CO2	Design BJT and MOSFET biasing circuits, amplifier configurations, and AC coupling techniques.	TPS 3	1.3.1, 1.4.1, 2.1.1	15%	SDG 9	1
CO3	Interpret small signal behaviour, frequency response, feedback effects, current mirrors, and differential amplifier characteristics.	TPS 3	1.1.1, 1.3.1, 2.1.1	15%	SDG 9	1
CO4	Use the characteristics and linear applications of operational amplifiers in analog electronic circuits.	TPS 3	1.4.1, 2.1.1, 5.2.1	15%	SDG 4	1

CO5	Develop active filters, oscillators, Schmitt triggers, signal generators, voltage-controlled oscillators, and phase locked loop circuits.	TPS 3	1.3.1, 1.4.1, 5.2.1	20%	SDG 9	1
CO6	Interpret the effects of noise, interference, feedback systems, and dual power supplies in analog electronic circuits.	TPS 3	1.1.1, 2.1.1, 5.2.1	20%	SDG 7	1
			Total	**100%**		

3. Assessment Pattern

CO	CAT1 (% of Marks)	OCR (% of Marks)	Model Test CO-wise (% of Marks)	Terminal Exam (% of Marks)
CO1	40	15	50	50
CO2	30	15		
CO3	30	20		
CO4	-	15	50	50
CO5		15		
CO6		20		
Total	**100**	**100**	**100**	**100**

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 – Diode Circuits and Power Supplies (CO1)

Diode characteristics, clipping circuits, clamping circuits, half-wave rectifier, full-wave rectifier, bridge rectifier, capacitor filters, voltage regulators, regulated power supplies, and dual power supply circuits.

Module 2 – BJT and MOSFET Amplifiers (CO2)

BJT characteristics, MOSFET characteristics, transistor biasing techniques, AC coupling, common emitter amplifier, common source amplifier, and basic amplifier configurations.

Module 3 – Small Signal and Feedback Amplifiers (CO3)

Small signal analysis of transistor circuits, frequency response of amplifiers, multistage amplifiers, feedback amplifiers, current mirrors, and differential amplifiers.

Module 4 – Operational Amplifier Fundamentals (CO4)

Characteristics of ideal and practical operational amplifiers, inverting amplifier, non-inverting

amplifier, summing amplifier, subtractor, integrator, differentiator, difference amplifier, and instrumentation amplifier.

Module 5 – Analog Signal Processing Circuits (CO5)

Precision rectifier, active filters, Schmitt triggers, oscillators, signal generators, voltage-controlled oscillators, and phase locked loop circuits.**Module 6 – Noise, Interference, and Analog Circuit Applications (CO6)**

Sources of noise and interference in electronic circuits, noise reduction techniques, feedback effects, amplifier stability, analog signal conditioning circuits, and analog electronic system applications.

Textbook

1. Paul Horowitz and Winfield Hill, *The Art of Electronics*, 3rd Edition, Cambridge University Press, 2015.
   ISBN-13: 9780521809269
2. Sedra and Smith, *Microelectronic Circuits*, 8th Edition, Oxford University Press, 2020.
   ISBN-13: 9780190853464

Reference Books & web resources

1. Robert L. Boylestad and Brian A. Olivari, *Electronic Devices and Circuit Theory*, 14th Edition, Pearson Education, 2023.ISBN-13: 9780137631438
2. Thomas C. Hayes and Paul Horowitz, *Learning the Art of Electronics: A Hands-On Lab Course*, Cambridge University Press, 2016.ISBN-13: 9780521177238
3. Sergio Franco, *Design with Operational Amplifiers and Analog Integrated Circuits*, 4th Edition, McGraw Hill, 2014.ISBN-13: 9780078028168
4. Ramakant A. Gayakwad, *Op-Amps and Linear Integrated Circuits*, 4th Edition, Pearson Education, 2015.ISBN-13: 9789332552630
5. NPTEL – Basic Electronics, Prof. M. B. Patil, IIT Bombay. https://nptel.ac.in/courses/108101091.
6. NPTEL – Analog Circuits through SPICE Simulation: https://nptel.ac.in/courses/117105147

SDG Alignment

SDG Addressed	Academic Activity Aligned with SDG	Related Modules
SDG 4 – Quality Education	Development of analytical and practical knowledge in analog electronic circuits, operational amplifiers, and signal processing systems through theory and laboratory implementation	Modules 1–6
SDG 7 – Affordable and Clean Energy	Study of rectifiers, voltage regulators, regulated dual power supplies, and energy-efficient analog electronic circuits	Modules 1 and 6
SDG 9 – Industry, Innovation and Infrastructure	Design and analysis of amplifier circuits, active filters, oscillators, operational amplifier systems, and signal conditioning circuits used in industrial and embedded applications	Modules 2–6

4. Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	CO Mapping
Module 1 – Diode Circuits and Power Supplies			
1.1	Diode characteristics and applications	1	CO1
1.2	Clipping and clamping circuits	1	CO1
1.3	Half-wave and full-wave rectifiers	1	CO1
1.4	Bridge rectifier, filters, regulated power supplies, and dual power supply circuits	1	CO1
Module 2 – BJT and MOSFET Amplifiers			
2.1	BJT characteristics and biasing techniques	1	CO2
2.2	MOSFET characteristics and biasing techniques	1	CO2
2.3	AC coupling and amplifier configurations	1	CO2
2.4	Common emitter and common source amplifiers	1	CO2
Module 3 – Small Signal and Feedback Amplifiers			
3.1	Small signal analysis of transistor circuits	1	CO3
3.2	Frequency response of amplifiers	1	CO3
3.3	Multistage and feedback amplifiers	1	CO3
3.4	Current mirrors and differential amplifiers	1	CO3
Module 4 – Operational Amplifier Fundamental			
4.1	Ideal and practical operational amplifiers	1	CO4
4.2	Inverting and non-inverting amplifiers	1	CO4
4.3	Summing amplifier, subtractor, and difference amplifier	1	CO4
4.4	Integrator, differentiator, and instrumentation amplifier	1	CO4
Module 5 – Analog Signal Processing Circuits			
5.1	Precision rectifier and active filters	1	CO5
5.2	Schmitt triggers and oscillators	1	CO5
5.3	Signal generators and voltage-controlled oscillators	1	CO5
5.4	Phase locked loop circuits	1	CO5
Module 6 – Noise, Interference, and Analog Circuit Applications			
6.1	Sources of noise and interference in electronic circuits	1	CO6
6.2	Noise reduction and shielding techniques	1	CO6
6.3	Feedback effects and amplifier stability	1	CO6
6.4	Analog signal conditioning and applications	1	CO6
	Total Theory Hours	**24**	

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	CO Mapping
1	Clipping and Clamping Circuits using Diodes	Simulation	Analyse waveform shaping circuits using diode networks	CO1
2	Half-Wave, Full-Wave, and Bridge Rectifiers	Simulation	Analyse rectifier circuits and ripple characteristics	CO1
3	Dual Power Supply using Voltage Regulators	Experimental	Implement regulated ±12V / ±15V dual power supply circuits	CO2
4	BJT Biasing Circuit Analysis	Simulation	Study transistor biasing characteristics and stability	CO2
5	MOSFET Biasing and Amplifier Characteristics	Simulation	Analyse MOSFET amplifier operation and biasing methods	CO3

6	Common Emitter and Common Source Amplifiers	Experimental	Implement transistor amplifier circuits	CO3
7	Frequency Response of BJT Amplifier	Simulation	Examine amplifier gain and bandwidth characteristics	CO4
8	Differential Amplifier using BJT	Simulation	Analyse differential amplifier operation	CO4
9	Inverting and Non-Inverting Op-Amp Amplifiers	Experimental	Implement basic operational amplifier circuits	CO5
10	Integrator, Differentiator, and Summing Amplifier using Op-Amp	Experimental	Analyse linear operational amplifier applications	CO5
11	Active Low Pass and High Pass Filters	Experimental	Implement active filter circuits using operational amplifiers	CO6
12	Schmitt Trigger and Oscillator Circuits	Experimental	Analyse waveform generation and switching circuits	CO6

Course Designer(s):

Sl. No.	Name, Designation & Department	Email ID
1	Mr. S. Parthasarathi, Assistant Professor, Department of Mechatronics Engineering.	Parthasarathi_s@tce.edu
2	Dr. M. M. Devarajan, Assistant Professor, Department of Mechatronics Engineering.	mmdmech@tce.edo
3	Dr. S. A. R. Sheik Masthan, Assistant Professor, Department of Mechatronics Engineering	sarsmech@tce.edu

26MTCF0	MANUFACTURING PROCESS LABORATORY	Category	L	T	P	Credit	Exam Type
		PCC	0	0	3	1.5	Practical

Preamble

Manufacturing processes are used to convert raw materials into finished products with the required shape, size, and properties. These processes are broadly classified into casting, forming, machining, joining, and finishing processes. Casting is one of the oldest manufacturing methods in which molten material is poured into a mould cavity and allowed to solidify into the desired shape. This course provides students with practical knowledge and hands-on experience in casting, metal joining, and machining processes. It emphasizes the study of working principles, process parameters, equipment, advantages, limitations, and industrial applications of various manufacturing techniques used in modern industries.

Prerequisite

Nil

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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	Prepare a mould using suitable casting process.	TPS 3	5.2.2, 4.2.1	SDG 9	2
CO2	Select a suitable material and process for a given product to perform welding.	TPS 3	3.2.3, 5.1.1	SDG 9	3
CO3	Perform tapering, turning and threading in lathe for the given component.	TPS 3	5.2.2, 4.3.1	SDG 8	3
CO4	Machine a given component using suitable milling process	TPS 3	5.2.2, 3.4.1	SDG 9	3
CO5	Machine a given component using suitable Drilling process	TPS 3	4.3.1, 5.2.1	SDG 8	3
CO6	Fabricate a given component by Additive manufacturing and slicing operation	TPS 3	5.1.2, 3.2.2	SDG 12	3

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 curriculum

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1.	Preparation of Mould for sand casting using single piece pattern	Basic	To prepare a sand mould using a single piece pattern for metal casting.	CO1
2.	Preparation of Mould for sand casting using split pattern	Basic	To prepare a sand mould using a split pattern and understand mould assembly techniques.	CO1
3.	Make a butt/lap/ corner/ Tee joint using the given metal strips in ARC welding	Intermediate	To produce different welded joints using ARC welding techniques.	CO2
4.	Make a butt/lap/ corner/ Tee joint using the given metal strips in TIG welding	Intermediate	To fabricate different welded joints using TIG welding process.	CO2
5.	Make a butt/lap/ corner/ Tee joint using the given metal strips in SPOT welding	Intermediate	To create sheet metal joints using spot welding operation.	CO2
6.	Plain, Taper and Step turning in lathe	Intermediate	To perform plain, taper, and step turning operations on a lathe machine.	CO3
7.	Grooving (UCD) and Thread (Left), and Thread (Right) in lathe	Advanced	To carry out grooving and left/right-hand thread cutting operations in a lathe.	CO3
8.	Spur / Helical Gear Cutting in Horizontal Milling Machine	Advanced	To machine spur and helical gears using a horizontal milling machine.	CO4
9.	Key Way Milling and Flat Milling in Vertical Milling Machine	Advanced	To perform keyway and flat milling operations using a vertical milling machine.	CO4
10.	Drilling, Counter Boring and Tapping	Advanced	To perform drilling, counter boring, and tapping operations on a workpiece.	CO5
11.	Fabrication of a Component Using Solid-State Additive Manufacturing	Advanced	To fabricate a component using solid-state additive manufacturing techniques.	CO6

Course Designer(s):

1. Mr.S.Rajkumar, Assistant Professor, Mechatronics srmech@tce.edu

2. Mr. M. Karuppaiah Rajkumar, Assistant Professor, Mechatronics Engineering mkrmect@tce.edu

		Category	L	T	P	Credit	Exam Type
26MTEB0	**MECHATRONIC SYSTEMS**	**ESC**	**1**	**0**	**4**	**3**	**TCP-P**

Preamble

This course is designed to provide students with practical exposure to the interdisciplinary concepts of mechanical, electrical, electronics, and embedded systems used in modern mechatronic applications. The course emphasizes hands-on training in electrical wiring, electronic circuit implementation, PCB fabrication, soldering, embedded programming using Raspberry Pi Pico, and system integration techniques. Students gain experience through assembly, disassembly, analysis, and troubleshooting of industrial and household mechatronic systems such as robots, 3D printers, washing machines, and microwave ovens. The laboratory oriented approach enhances technical skills, creativity and problem solving ability by preparing students for industrial applications, product development, and emerging smart technologies.

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	Understand the fundamentals of electrical, electronics, embedded systems, and mechatronics workshop practices	TPS2	1.3.1	15	NC	0
CO2	Identify components used in mechatronic systems and consumer products.	TPS2	1.3.1	15	NC	0
CO3	Demonstrate practical skills in wiring, soldering, PCB fabrication, and electronic circuit implementation.	TPS3	1.4.1	15	8	1
CO4	Experiment in assembling and disassembling industrial and domestic mechatronic systems.	TPS3	2.1.2	15	12	1
CO5	Develop embedded programming using Raspberry Pi Pico for basic automation applications.	TPS3	2.1.2	20	8	1
CO6	Recommend electrical, mechanical, electronics, and embedded system components to develop simple mechatronic applications.	TPS4	2.1.2	20	8	3

Assessment Pattern

CO	Theory	Practical		Terminal Exam Practical
	CAT 2	OCR/Continuous Assessment	Model Test CO-wise	
	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20	-	-	-
CO2	20	10	-	-
CO3	30	30	50	50
CO4	10	20		
CO5	20	20	50	50
CO6	-	20		
Total	100	100	100	100

Students should submit a model prototype designed, fabricated and tested at the end of the course.

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: BASICS OF MECHATRONICS WORKSHOP

Workshop safety practices, Tools, Measuring instruments, Basic Mechanical and Electrical quantities, Identification of Mechanical, Electrical and Electronic components and symbols.

Module 2:MECHATRONIC SYSTEMS AND APPLICATIONS

Introduction to mechatronic systems, Subsystems, Components of Mechanical, Electrical, Electronics and Computer systems, Sensors, controllers and actuators, Interfacing and its Issues, Case Studies. Automobile, 3D printer and automatic washing machine

Module 3:BASICS OF MECHANICAL SYSTEMS

Types of Mechanical components - Gears, Gear Ratio; 3D Modelling using TinkerCAD; 3D printing, Applications.

Module 4:BASICS OF ELECTRICAL SYSTEMS

Electrical Wiring- One-way and two-way wiring systems, Electrical protection devices: Fuse, MCB, MCCB, ELCB, Earthing concepts, Applications.

Module 5:BASICS OF ELECTRONIC CIRCUITS AND PCB FABRICATION

Semiconductor switching devices, Transistor switching circuits, MOSFET and Thyristor operation, 555 Timer IC applications, PCB layout and wet etching process, Soldering and desoldering techniques. Communication - LAN cabling fundamentals.

Module 6:DEVELOPMENT OF BASIC MECHATRONICS SYSTEMS

Introduction to Raspberry Pi Pico, GPIO interfacing concepts, LED, switch, and buzzer interfacing; Mechanical, Electrical, Electronics and Computer systems interfacing, Development of basic mechatronic applications using Pico, Case Studies.

Text Book

1. W. Bolton, Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, Pearson,2019.
2. K. P. Ramachandran and G. K. Vijayaraghavan, M.S.Balasundram, Mechatronics: Integrated Mechanical Electronic Systems, Wiley India, 2019.
3. Floyd, Electronic Devices, Pearson,2019.
4. A. K. Sawhney, Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai, 2020.
5. Simon Monk, Programming Raspberry Pi Pico, McGraw Hill, 2014.
6. Groover, Automation, Production Systems and CIM, Pearson,2010.

Reference Books & web resources

1. John G. Proakis, “Digital Communications”, McGraw Hill International Edition, Fourth Edition, 2001.
2. Bernard Sklar: “Digital Communications: Fundamentals and Applications”, 2nd Edition, Prentice Hall, 2001
3. John R Barry, Edward Lee and David G. Messerschmitt, “Digital Communication”, 3rd Edition. Springer, 2003.

SDG Alignment

Activities aligned with SDGs addressed:

1.CO4: Assembly, disassembly, repair, maintenance, and reuse of electronic and mechatronic systems to promote sustainable engineering practices and reduced electronic waste.

2.CO6: Development of smart automation applications such as automatic lighting, smart monitoring systems, and intelligent control systems for modern infrastructure.

Course Contents and Lecture Schedule

Module No	Topics	No of Periods	**Course Outcomes**
1	**Module 1: BASICS OF MECHATRONICS WORKSHOP** Workshop safety practices, Tools, Measuring instruments, Basic Mechanical and Electrical quantities, Identification of Mechanical, Electrical and Electronic components and symbols.	2	CO1, CO2
2	**Module 2:MECHATRONIC SYSTEMS AND APPLICATIONS** Introduction to mechatronic systems, Subsystems, Components of Mechanical, Electrical, Electronics and Computer systems, Sensors, controllers and actuators, Interfacing and its Issues, Case Studies. Automobile, 3D printer and automatic washing machine	2	CO2,CO4
3	**Module 3:BASICS OF MECHANICAL SYSTEMS** Types of Mechanical components - Gears, Gear Ratio; 3D Modelling using TinkerCAD; 3D printing, Applicaitons	2	CO2,CO4
4	**Module 4:BASICS OF ELECTRICAL SYSTEMS** Electrical Wiring- One-way and two-way wiring systems, Electrical protection devices: Fuse, MCB, MCCB, ELCB, Earthing concepts, Applications.	2	CO3,CO6
5	**Module 5:BASICS OF ELECTRONIC CIRCUITS AND PCB FABRICATION**	2	CO5,CO6

	Semiconductor switching devices, Transistor switching circuits, MOSFET and Thyristor operation, 555 Timer IC applications, PCB layout and wet etching process, Soldering and desoldering techniques. Communication - LAN cabling fundamentals.		
6	**Module 6:DEVELOPMENT OF BASIC MECHATRONICS SYSTEMS** Introduction to Raspberry Pi Pico, GPIO interfacing concepts, LED, switch, and buzzer interfacing; Mechanical, Electrical, Electronics and Computer systems interfacing, Development of basic mechatronic applications using Pico, Case Studies.	2	CO5,CO6
	Total Periods	12	

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1.	Electrical wiring practices and testing with:Fuse, MCB, MCCB, ELCB	2	3	CO3
2.	Electrical wiring practices: One-way switch wiring Two-way switch wiring	2	3	CO3
3.	Local Area Network (LAN) structure cabling and testing.	1	3	CO3
4.	Identification of electrical, mechanical, and electronic circuits available in an automobile.	1	2	CO3
5.	Assembly and disassembly of a 3D Printer and study of component working.	2	2	CO3,CO4
6.	Assembly and disassembly of a Washing Machine and explanation of subsystem operations.	2	2	CO3,CO4
7.	PCB layout design for a given electronic circuit.	3	3	CO3
8.	Soldering and desoldering techniques.	3	3	CO3
9.	Design a PCB for Interfacing LED and push button with Raspberry Pi Pico.	3	3	CO3,CO4,CO5
10.	Design a PCB for Interfacing LCD and Keyboard with Raspberry Pi Pico.	3	3	CO3,CO4,CO5
11.	Design a PCB for Interfacing temperature or ultrasonic sensor with Raspberry Pi Pico.	3	3	CO3,CO4,CO5
12.	Design a PCB for Controlling DC motor or servo motor	3	3	CO3,CO4,CO5

	using Raspberry Pi Pico.			
13.	Build a creative toy as a Mechatronics system.	3	9	CO6,CO5,CO4, CO3

Course Designer(s):

1. Dr.M.M.Devarajan, Asst. Prof., Mect mmdmech@tce.edu
2. M.A.Ganesh, Asst. Prof., Mect ganeshma2015@tce.edu
3. Mr.S.Parthasarathi, Asst. Prof., Mect parthasarathi_s@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

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

7. 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

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