

Thiagarajar College of Engineering, Madurai-625015

(An Autonomous Institution Affiliated to Anna University)

B.E. Electrical and Computer Engineering**Scheduling of Courses****Programme Educational Objectives (PEOs)****Programme Specific Outcomes (PSOs)****Programme Outcomes(POs)**

**FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2026-27 ONWARDS**



Thiagarajar
College of Engineering
where quality and ethics matter



www.tce.edu

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015**B. E. ELECTRICAL AND COMPUTER ENGINEERING****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	

Program Outcomes:**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 Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

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

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

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

Knowledge and Attitude Profile (WK):

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

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

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

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

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

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

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

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

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

B.E. – Electrical and Computer Engineering

Programme Educational Objectives (PEOs)

PEO1: Graduates will establish successful careers in electrical, electronics, computing, and allied fields, or pursue higher studies and research.

PEO2: Graduates will analyze, design, and develop innovative, sustainable, and ethical solutions to real-world problems in electrical and computer engineering.

PEO3: Graduates will demonstrate effective teamwork, leadership, communication skills, social responsibility, and lifelong learning in professional environments.

Programme Specific Outcomes (PSOs)

PSO 1: Graduates will be able to design, implement, and optimize intelligent and resilient electrical power, control, and renewable energy systems for sustainable and efficient applications.

PSO 2: Graduates will be able to design and develop intelligent embedded systems integrating AI/ML, IoT, and signal processing for real-world hardware and software applications

Thiagarajar College of Engineering, Madurai-625015

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B.E. Electrical and Computer Engineering

Syllabi for the First Year

FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2026-27 ONWARDS



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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015**B.E. ELECTRICAL AND COMPUTER ENGINEERING****CREDIT DISTRIBUTION**

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

Sl. No.	Category	Credits	
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E.	Program Elective Courses (PEC)	21	21
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Minimum Credits to be earned for the award of the Degree		174	131
		From A to G and the successful completion of H	

B.E. Electrical and Computer Engineering - SCHEDULING OF COURSES FOR STUDENTS JOINED FROM THE ACADEMIC YEAR 2026-27 ONWARDS														
Sem	Theory / Theory cum Practical / Practical											CDIO Courses	Audit Courses (Mandatory Non- credit)	Credit
	1	2	3	4	5	6	7	8	9 Firmware TCP	10 Firmware TCP				
I	26MASA0 Applied Calculus for Engineers (BSC-4)	26CHSB0 Applied Chemistry (BSC-3)	26EGHA0 Technical English (TCP) (HSMC-3)	26ERCA0 Electric Circuit Analysis (PCC-3)		26EREA0 Python Programming (TCP) (ESC-3)	26ERCB0 Electric Circuit Analysis Laboratory (PCC-1.5)	26CHSC0 Chemistry Laboratory (BSC-1.5)				26CCEA0 Introduction to Engineering (TCP) (ESC-2)	26TAA0 Heritage of Tamils 26CCAA0 Vision and Speed Maths (AC-0)	21
II	26ERSD0 Matrices and Linear Algebra (BSC-3)	26PHSA0 Physics (BSC-3)	26ERCC0 Electronic Devices and Circuits (PCC-3)	26ERCD0 Software Engineering (TCP) (PCC-4)		26EREC0 Linear Integrated Circuits (ESC-3)	26CCEB0 Biology for Engineers (ESC-3)	26PHSB0 Physics Laboratory (BSC-1.5)			26ERCE0 Electronic Devices and Circuits Laboratory (PCC- 1.5)		26TAAB0 Tamils and Technology 26CCAB0 Foundations of Problem Solving-1 (AC-0)	22
III	26ERSG0 Probability and Statistics (BSC-3)	26ERCF0 C Programming (TCP) (PCC-3)	26ERCG0 Data Communication and Networks (PCC-3)	26ERCH0 Digital Systems (PCC-4)	26ERCJ0 Integrated Circuits Laboratory (PCC- 1.5)	26EREF0 Electrical Machines (ESC-3)	26ERCK0 Electrical Machines Laboratory (PCC- 1.5)	26CCLA0 Building Communication Skills (EEC-1)	26ERCL0 Foundation (PCC-2)			26CCEC0 Design Thinking (ESC-3)	26CCAC0 Constitution of India (AC-0)	25
IV	26ERSH0 Ordinary Differential Equations and Numerical Methods (BSC-3)	26ERCM0 Data Structures (PCC-3)	26ERCN0 Control Systems (PCC-3)	26ERCP0 Database Management Systems (PCC-3)	26ERCQ0 Data Structures Laboratory (PCC-1.5)	26CCED0 Environment and Sustainability (ESC-3)	26EGHB0 Professional Communication Laboratory (HSMC-2)	26CCLB0 Numerical Skills and Quantitative Problem Solving (EEC-1)	26ERCR0 Embedded Hardware (PCC- 3.5)	26ERCS0 Embedded Software (PCC- 3.5)	26ERCT0 Database Management Systems Laboratory (PCC-1.5)		26CCAD0 Indian Knowledge System (AC-0)	28
V	26CCHA0 Project Management (HSMC-3)	26EREJ0 Power Electronics (ESC-3)	26ERCU0 Computer Organization and Architecture (PCC-3)	26ERCV0 Artificial Intelligence (PCC-3)	26ERCW0 Power System Engineering (PCC-3)		26CCLC0 Aptitude Skills (EEC-2)	26ERFXX Basic Science Elective / Language Elective (OEC-3)	26ERCX0 Firmware Development (PCC- 3.5)	26ERCY0 Firmware Testing & Validation (PCC- 3.5)		26ERLA0 Project-I (EEC-3)	26CCAE0 Universal Human Values and Ethics (AC-0)	30
VI	26CCHB0 Accounting and Finance (HSMC-3)	26ERCZ0 Web Technology (PCC-3)	26ERDA0 Web Technology Laboratory (PCC-1.5)	26ERDB0 Artificial Intelligence Laboratory (PCC- 1.5)		26ERPXX (3)	26ERGXX Interdisciplinary Elective (OEC-3)	26ERPXX (3)	26ERDC0 Use Case I – EV (PCC- 2)	26ERDD0 Use Case II – Energy (PCC- 2)	26ERDE0 Use Case III – HVAC (PCC- 2)	26ERLB0 Project-II (EEC-3)	26CCAF0 Disaster Management (AC-0)	27
VII	26ERPXX (3)	26ERPXX (3)	26ERPXX (3)	26ERPXX (3)	26ERPXX (3)							26ERLC0 Project-III (EEC-3)		18
VIII												26ERLD0 Project-IV (EEC-3)		3
Total Credits														174

Mandatory requirement: First year category-wise credits are fixed i.e., HSMC: 3 | BSC: 16 | ESC: 11 | PCC: 13 | OEC: 0 | PEC: 0 | PW: 0 | Total: 43

Comparison of Electrical and Computer Core Courses

Electrical	Credit	Computer	Credit	Bajaj Firmware Vertical Core-TCP	Credit
Electric circuit Analysis	3	Software Engineering (TCP)	4	Foundation	2
Electronic Devices and Circuits	3	Database Management Systems	3	Embedded Hardware	3.5
Digital Systems	4	Computer Organization and Architecture	3	Embedded Software	3.5
Linear Integrated Circuits	3	Data Communication and Networks	3	Firmware Development	3.5
Control Systems	3	Artificial Intelligence	3	Firmware Testing & Validation	3.5
Power System Engineering	3	Web Technology	3	Use Case I – EV	2
Electric Circuit Analysis-Laboratory	1.5	Database Management Systems Laboratory	1.5	Use Case II – Energy	2
Electronic Devices and Circuits Laboratory	1.5	Data Structures Laboratory	1.5	Use Case III – HVAC	2
Integrated Circuits Laboratory	1.5	Web Technology Laboratory	1.5		
Electrical Machines Laboratory	1.5	Artificial Intelligence Laboratory	1.5		
		Data Structures	3		
EEE- Core	25	CSE Core	28		22
Power Electronics ESC	3	C Programming	3		
Electrical Machines-ESC	3				
Total Credits	31		31		

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-625015**B.E. (ELECTRICAL AND COMPUTER ENGINEERING)****COURSES OF STUDY****FIRST SEMESTER**

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26MASA0	Applied Calculus for Engineers	BSC	3	1	-	4
26CHSB0	Applied Chemistry	BSC	3	-	-	3
26ERCA0	Electric Circuit Analysis	PCC	2	1	-	3
THEORY CUM PRACTICAL						
26EGHA0	Technical English	HSMC	2	-	2	3
26EREA0	Python Programming	ESC	2	-	2	3
26CCEA0	Introduction to Engineering	ESC	1	-	2	2
PRACTICAL						
26ERCB0	Electric Circuit Analysis Laboratory	PCC	-	-	3	1.5
26CHSC0	Chemistry Laboratory	BSC	-	-	3	1.5
AUDIT COURSES						
26TAAA0	Heritage of Tamils	A	-	-	-	-
26CCAA0	Vision and Speed Maths	A	-	-	-	-
Total			13	2	12	21

BSC	Basic Sciences Courses
PCC	Programme Core Course
ESC	Engineering Sciences Courses
HSMC	Humanities, Social Sciences, and Management Courses
A	Audit Courses
L	Lecture
T	Tutorial
P	Practical

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-625015**B.E. (ELECTRICAL AND COMPUTER ENGINEERING)****COURSES OF STUDY****SECOND SEMESTER**

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26ERSD0	Matrices and Linear Algebra	BSC	3	-	-	3
26PHSA0	Physics	BSC	2	1	0	3
26ERCC0	Electronic Devices and Circuits	PCC	3	-	-	3
26EREC0	Linear Integrated Circuits	ESC	3	-	-	3
26CCEB0	Biology for Engineers	ESC	3	-	-	3
THEORY CUM PRACTICAL						
26ERCD0	Software Engineering	PCC	3	-	2	4
PRACTICAL						
26PHSB0	Physics Laboratory	BSC	-	-	3	1.5
26ERCE0	Electronic Devices and Circuits Laboratory	PCC	-	-	3	1.5
AUDIT COURSES						
26TAAB0	Tamils and Technology	A	-	-	-	-
26CCAB0	Foundations of Problem Solving-1	A	-	-	-	-
Total			17	1	8	22

BSC	Basic Sciences Courses
PCC	Programme Core Course
ESC	Engineering Sciences Courses
A	Audit Courses
L	Lecture
T	Tutorial
P	Practical

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-625015**B.E. (ELECTRICAL AND COMPUTER ENGINEERING)****COURSES OF STUDY****THIRD SEMESTER**

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26ERSG0	Probability and Statistics	BSC	3	-	-	3
26ERCG0	Data Communication and Networks	PCC	3	-	-	3
26ERCH0	Digital Systems	PCC	4	-	-	4
26EREF0	Electrical Machines	ESC	3	-	-	3
26CCLA0	Building Communication Skills	EEC	1	-	-	1
26ERCL0	Foundation	PCC	2	-	-	2
THEORY CUM PRACTICAL						
26ERCF0	C Programming	PCC	2	-	2	3
PRACTICAL						
26ERCJ0	Integrated Circuits Laboratory	PCC	-	-	3	1.5
26ERCK0	Electrical Machines Laboratory	PCC	-	-	3	1.5
CDIO COURSES						
26CCEC0	Design Thinking	ESC	3	-	-	3
AUDIT COURSES						
26CCAC0	Constitution of India	A	-	-	-	-
Total			21	-	8	25

BSC	Basic Sciences Courses
PCC	Programme Core Course
ESC	Engineering Sciences Courses
EEC	Employability Enhancement Courses
A	Audit Courses
L	Lecture
T	Tutorial
P	Practical

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-625015**B.E. (ELECTRICAL AND COMPUTER ENGINEERING)****COURSES OF STUDY****FOURTH SEMESTER**

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26ERSH0	Ordinary Differential Equations and Numerical Methods	BSC	3	-	-	3
26ERCM0	Data Structures	PCC	3	-	-	3
26ERCN0	Control Systems	PCC	3	-	-	3
26ERCP0	Database Management System	PCC	3	-	-	3
26CCED0	Environment and Sustainability	ESC	3	-	-	3
THEORY CUM PRACTICAL						
26ERCR0	Embedded Hardware	PCC	2	-	3	3.5
26ERCS0	Embedded Software	PCC	2	-	3	3.5
PRACTICAL						
26ERCQ0	Data Structures Laboratory	PCC	-	-	3	1.5
26EGHB0	Professional Communication Laboratory	HSMC	-	-	4	2
26CCLB0	Numerical Skills and Quantitative Problem Solving	EEC	-	-	2	1
26ERCT0	Database Management Systems Laboratory	PCC	-	-	3	1.5
AUDIT COURSES						
26CCAD0	Indian Knowledge System	A	-	-	-	-
Total			19	0	18	28

BSC	Basic Sciences Courses
PCC	Programme Core Course
ESC	Engineering Sciences Courses
HSMC	Humanities, Social Sciences, and Management Courses
EEC	Employability Enhancement Courses
A	Audit Courses
L	Lecture
T	Tutorial
P	Practical

THIAGARAJARCOLLEGE OF ENGINEERING, MADURAI-625015**B.E. (ELECTRICAL AND COMPUTER ENGINEERING)****COURSES OF STUDY****FIFTH SEMESTER**

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26CCHA0	Project Management	HSMC	3	-	-	3
26EREJ0	Power Electronics	ESC	3	-	-	3
26ERCU0	Computer Organization and Architecture	PCC	3	-	-	3
26ERCV0	Artificial Intelligence	PCC	3	-	-	3
26ERCW0	Power System Engineering	PCC	3	-	-	3
26CCLC0	Aptitude Skills	EEC	2	-	-	2
26ERFXX	Basic Science Elective / Language Elective	OEC	3	-	-	3
THEORY CUM PRACTICAL						
26ERCX0	Firmware Development	PCC	2	-	3	3.5
26ERCY0	Firmware Testing & Validation	PCC	2	-	3	3.5
CDIO COURSES						
26ERLA0	Project-I	EEC	-	-	6	3
AUDIT COURSES						
26CCAE0	Universal Human Values and Ethics	A	-	-	-	-
Total			24	0	12	30

HSMC	Humanities, Social Sciences, and Management Courses
PCC	Programme Core Course
OEC	Open Elective Course
ESC	Engineering Sciences Courses
EEC	Employability Enhancement Courses
A	Audit Courses
L	Lecture
T	Tutorial
P	Practical

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-625015**B.E. (ELECTRICAL AND COMPUTER ENGINEERING)****COURSES OF STUDY****SIXTH SEMESTER**

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26CCHB0	Accounting and Finance	HSMC	3	-	-	3
26ERCZ0	Web Technology	PCC	3	-	-	3
26ERGXX	Interdisciplinary Elective	OEC	3	-	-	3
26ERPXX	Program Elective Course	PEC	3	-	-	3
26ERPXX	Program Elective Course	PEC	3	-	-	3
THEORY CUM PRACTICAL						
26ERDC0	Use Case I – EV	PCC	1	-	2	2
26ERDD0	Use Case II – Energy	PCC	1	-	2	2
26ERDE0	Use Case III – HVAC	PCC	1	-	2	2
26ERLB0	Project-II	EEC	-	-	6	3
PRACTICAL						
26ERDA0	Web Technology Laboratory	PCC	-	-	3	1.5
26ERDB0	Artificial Intelligence Laboratory	PCC	-	-	3	1.5
AUDIT COURSES						
26CCAF0	Disaster Management	A	-	-	-	-
Total			18	0	18	27

PCC	Programme Core Course
OEC	Open Elective Course
HSMC	Humanities, Social Sciences, and Management Courses
EEC	Employability Enhancement Courses
A	Audit Courses
L	Lecture
T	Tutorial
P	Practical

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-625015**B.E. (ELECTRICAL AND COMPUTER ENGINEERING)****COURSES OF STUDY****SEVENTH SEMESTER**

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26ERPXX	Program Elective Course	PEC	3	-	-	3
26ERPXX	Program Elective Course	PEC	3	-	-	3
26ERPXX	Program Elective Course	PEC	3	-	-	3
26ERPXX	Program Elective Course	PEC	3	-	-	3
26ERPXX	Program Elective Course	PEC	3	-	-	3
CDIO COURSES						
26ERLC0	Project-III	EEC	-	-	6	3
Total			15	0	6	18

EEC Employability Enhancement Courses
 L Lecture
 T Tutorial
 P Practical

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-625015**B.E. (ELECTRICAL AND COMPUTER ENGINEERING)****COURSES OF STUDY****EIGHTH SEMESTER**

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
CDIO COURSES						
26ERLD0	Project-IV	EEC	-	-	6	3
Total			-	-	6	3

EEC Employability Enhancement Courses
L Lecture
T Tutorial
P Practical

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-625015**B.E. (ELECTRICAL AND COMPUTER ENGINEERING)****SCHEME OF EXAMINATIONS**

(For the candidates admitted from 2026- 27 onwards)

FIRST SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment	Terminal Exam	Max. Marks	Terminal Exam	Total
THEORY								
1	26MASA0	Applied Calculus for Engineers	3	40	60	100	27	50
2	26CHSB0	Applied Chemistry	3	40	60	100	27	50
3	26ERCA0	Electric Circuit Analysis	3	40	60	100	27	50
THEORY CUM PRACTICAL								
4	26EGHA0	Technical English	3	50	50	100	25	50
5	26EREA0	Python Programming	3	50	50	100	25	50
6	26CCEA0	Introduction to Engineering	3	50	50	100	25	50
PRACTICAL								
7	26ERCB0	Electric Circuit Analysis Laboratory	3	60	40	100	18	50
8	26CHSC0	Chemistry Laboratory	3	60	40	100	18	50
AUDIT COURSES								
9	26TAAA0	Heritage of Tamils	-	-	-	-	-	-
10	26CCAA0	Vision and Speed Maths	-	-	-	-	-	-

26MASA0	APPLIED CALCULUS FOR ENGINEERS
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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", 12th edition, 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
- 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, bvkmattce@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, pbummat@tce.edu
7. Dr. Pradnya Gaonkar, Senior customer success engineer, math works pgaonkar@mathworks.com

26CHSB0	APPLIED CHEMISTRY
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Category	L	T	P	Credit
BSC	3	0	0	3

1. Preamble

This course equips students of circuit and computer branches with chemical principles underlying key engineering technologies. It covers water quality assessment and treatment, spectroscopic analytical techniques, electrochemical energy storage systems, and chemistry of advanced engineering materials.

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.	2	1.2.1	10	SDG 3 – Good Health and well-being SDG 6 - Clean water and sanitation	2
CO2	Apply standard estimation techniques, appropriate water treatment methods to select and justify solutions for boiler feed water preparation and industrial effluent treatment.	3	1.2.1	20	SDG 6 - Clean water and sanitation	2
CO3	Apply the principles and instrumentation of spectroscopic techniques to identify materials and interpret spectra for chemical, environmental, biomedical, and space applications.	3	1.2.1	20	SDG 3 – Good Health and well-being	2
CO4	Apply electrochemical principles to analyze energy storage systems and photovoltaic devices	3	1.2.1	16	SDG 7 – Affordable and Clean Energy	2

CO5	Use the concepts of corrosion mechanisms and surface protection techniques to select appropriate corrosion control measures for electronic devices.	3	1.2.1	14	SDG 9 – Industry, Innovation and Infrastructure	2
CO6	Apply structure–property relationships of ceramics, carbon-based nanomaterials to select suitable materials for specific applications.	3	1.2.1	20	SDG 9 - Industry, Innovation and Infrastructure SDG 12 – Responsible consumption	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			32	50	16
CO5			28		14
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 – Softening of water: Internal and External treatment methods – Ion-Exchange method, Desalination process: reverse- and forward osmosis, electrodialysis, 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–Visiblespectroscopy-Fluorescence-Inductively Coupled Plasma-Optical Emission, Infra-red-Nuclear magnetic resonance, Magnetic resonance imaging - Spectroscopy in automobile, environmental, biomedical & space applications. [8 hours]

Electrochemical technologies for energy storage and surface protection: Basics of electrochemistry – Batteries: Parameters, Primary -and Secondary batteries (Lead-acid, Lithium-ion, Sodium, Air-batteries, Redox-flow battery, Numerical Problems) –Fuel cells - Photovoltaics and its types, Numerical Problems. Hydrogen generation and storage. Corrosion of electronic devices: causes, effects, Electrochemical methods of corrosion analysis. Control measures -Electroplating-Electroless plating. [11 hours]

Chemistry of Engineering materials: Bonding and the properties of materials -Ceramics and advanced ceramics: types, properties, applications – Nano-materials: Synthesis, structure, properties and applications. Carbon based materials – Graphene, Carbon fibers -. Molecular electronics - Conducting polymers and organic semiconductors, Organic light-emitting devices (OLEDs), Applications in wearable and flexible electronics. [7 hours]

6. Text Book

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

Reference Books & web resources

1. S.S. Dara and S.S. Umare, "A Textbook of Engineering Chemistry", S.Chand & Company, 12th Edition, Reprint, 2022.
2. V. K. Ahluwalia, Instrumental Methods of Chemical Analysis, Springer Cham, 1st Edition, 2023.
3. T. Pradeep, A Textbook of Nanoscience and Nanotechnology, McGraw-Hill (Indian Edition), 2012
4. Organic Semiconductors - <https://www.youtube.com/watch?v=q2fPrFay0A0&list=PL-WugosnKdMsy8abZQDVZWBNya2Opdklf>

7. Course Contents and Lecture Schedule

Module No	Topics	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 by EDTA 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-forward & reverse osmosis, electrodialysis, multistage flash distillation	1
1.7	Effluent Treatment -Advanced oxidation process. IOT-based sensor for water quality	1
2	SPECTROSCOPIC TECHNIQUES AND APPLICATIONS	
2.1	Introduction to Electromagnetic Radiation, Types of spectra	1
2.2	Principle, Instrumentation and Applications: UV-Visible spectroscopy	2
2.3	Fluorescence spectroscopy, Inductively Coupled Plasma-Optical Emission Spectroscopy	2
2.4	Infra-red spectroscopy	2
2.5	Nuclear magnetic resonance spectroscopy –Magnetic resonance imaging	1
2.6	Spectroscopy in environmental, biomedical & space applications	1
3	ELECTROCHEMICAL TECHNOLOGIES FOR ENERGY STORAGE AND SURFACE PROTECTION	
3.1	Electrochemistry-Introduction-Basics of electrochemistry-Redox process, EMF	1
3.2	Energy storage-Batteries, Battery quality parameters, Primary battery-Dry cell and Alkaline cell	1
3.3	Secondary battery-Lead-acid battery, Lithium-ion, Sodium, Air-	2

	batteries, Redox-flow battery, Numerical Problems	
3.4	Photovoltaics and its types, Numerical Problems	1
3.5	Fuel cells– Fundamentals, types and applications. Hydrogen generation and storage	2
3.6	Corrosion of electronic devices: causes, effects, Electrochemical methods of corrosion analysis	2
3.7	Control measures - Electroplating–Introduction, Process, Applications (Gold and nickel plating). Electroless plating – Principle, process, Applications (PCB manufacturing)	2
4	CHEMISTRY OF ENGINEERING MATERIALS	
4.1	Bonding and the property of materials - melting point-brittleness, ductility–thermal, electrical, and ionic conductivity-magnetic - optical-hydrophobic, hydrophilic properties	2
4.2	Ceramics and advanced ceramics: types, properties, applications	2
4.3	Nanomaterials – Classification, Synthesis and properties	1
4.4	Carbon based materials - Synthesis, structure, properties, and applications of graphene, carbon fibers	1
4.5	Molecular electronics - Conducting polymers and organic semiconductors, Organic light-emitting devices (OLEDs), Applications in wearable and flexible electronics	1
	Total Periods	36

8. Course Designer(s):

- | | |
|--|--|
| 1. Dr. V. Velkannan, Assistant Professor and Head (i/c), Chemistry | velkannan@tce.edu |
| 2. Dr. M. Velayudham, Assistant Professor, Chemistry | mvchem@tce.edu |
| 3. Dr. B. Shankar, Assistant Professor, Chemistry | bsrchem@tce.edu |
| 4. Dr. R. Sivakumar, Assistant Professor, Chemistry | rsrchem@tce.edu |
| 5. Dr. P. Ramkumar, Assistant Professor, Chemistry | prchem@tce.edu |

26ERCA0	ELECTRIC CIRCUIT ANALYSIS
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Category	L	T	P	Credit
PCC	2	1	0	3

1. Preamble

Electric Circuit Analysis is a foundational course in electrical engineering that establishes the analytical basis for advanced subjects such as power systems, control systems, electronics, and communication engineering. The course introduces fundamental circuit laws, phasor analysis, impedance concepts, and power relationships. It develops proficiency in AC and transient circuit analysis using mesh, nodal, and network theorem approaches. Students also gain understanding of two-port networks, three-phase systems, and magnetically coupled circuits. The analytical and problem-solving skills acquired through this course are essential for higher-level electrical engineering studies and related interdisciplinary applications.

2. Prerequisite

- Nil

3. Course Outcome

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

No.	Course Outcome	TPS Level	PI	CO Weightage	SDG addressed	SDG Level
CO1	Apply the fundamental laws of electric circuits, including circuit laws, phasor analysis, and impedance concepts to analyse AC and DC circuits with resistance, inductance, and capacitance.	TPS 3	1.3.1	10%	NC	
CO2	Apply mesh analysis, nodal analysis, and network theorems to solve sinusoidal steady-state circuit problems.	TPS 3	2.4.1	25%	NC	
CO3	Analyse the transient response of RL, RC, and RLC circuits for source-free, step, and sinusoidal excitations and determine frequency response characteristics including resonance.	TPS 4	2.4.2	20%	NC	
CO4	Examine two-port network parameters and their interrelations to analyse and interconnect complex networks.	TPS 4	2.1.1	15%	NC	
CO5	Apply balanced and unbalanced three-phase circuit analysis for star-delta connections and compute power using appropriate measurement techniques.	TPS 3	1.3.1	15%	NC	

CO6	Apply the principles of mutual inductance, dot conventions, and coupled circuit to compute energy and model magnetically coupled networks.	TPS 3	2.3.1	15%	NC	
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Note: TPS Level (TPS1–TPS5), PI format (x.y.z), Total CO weightage = 100%

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	30				10
CO2	40	50			25
CO3	30	50	30		20
CO4			30	30	15
CO5			20	30	15
CO6			20	40	15
Total	100	100	100	100	100

5. Syllabus

Module 1: Circuit laws – Sources – Resistance – Inductance – Capacitance – Reactance – Impedance – Types of connections – Equivalent circuit – Phasors – Phasor diagram – Power Triangle

Module 2: Sinusoidal Steady State Analysis

Mesh and Nodal analysis – Thevenin's Theorem – Norton's Theorem – Superposition Theorem – Source transformation theorem – Maximum power transfer theorem – Frequency response of the circuit – Resonance

Module 3: Transient Analysis

Source free response for RL, RC & RLC circuits – Step response for RL, RC & RLC circuits – Sinusoidal response for RL, RC & RLC circuits

Module 4: Two-port Networks

Impedance parameters – Admittance parameters – Hybrid parameters – Transmission parameters – Inter relation and interconnection of networks – Duality

Module 5: Three Phase Circuits & Coupled Circuits

Balanced and unbalanced star – delta connections – Power measurement – Mutual Inductance – Dot rules – Energy in coupled circuits

6. Learning Resources

6.1 Text Book

1. W. H. Hayt, J. K. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 7th Edition, New Delhi, 2007.
2. Charles K. Alexander, Matthew N. O. Sadiku, "Fundamentals of Electric Circuits", Tata McGraw Hill, 5th Edition, 2013.

6.2 Reference Books & Web resources

1. Mahmood Nahvi, Joseph A. Edminister, "Electric Circuits", Tata McGraw-Hill Education, 5th Edition, 2010.
2. Sudhakar A. and Shyam Mohan S. P., "Electric Circuit Analysis", Tata McGraw Hill, New Delhi, 2008.
3. NPTEL E-Learning Courses: Basic Electrical Circuits –
https://onlinecourses.nptel.ac.in/noc17_ee13
4. <https://www.electrical4u.com>

7. Course Contents and Lecture Schedule

Module No.	Topics	No. of Periods	Course Outcome
1.0	Electric Circuits		
1.1	Circuit laws, Sources, Resistance, Inductance, Capacitance, Reactance, Impedance	3	CO1
1.2	Types of connections, Equivalent circuit, Phasors, Phasor diagram, Power Triangle	3	CO1
2.0	Steady State Analysis		
2.1	Mesh and Nodal analysis	2	CO2
2.2	Thevenin's Theorem, Norton's Theorem, Superposition Theorem	2	CO2
2.3	Source transformation theorem, Maximum power transfer theorem, Frequency response of the circuit	2	CO2
2.4	Resonance	2	CO2
3.0	Transient Analysis		
3.1	Source free response for RL, RC & RLC circuits	2	CO3
3.2	Step response for RL, RC & RLC circuits	2	CO3
3.3	Sinusoidal response for RL, RC & RLC circuits	3	CO3
4.0	Two-port Networks		
4.1	Impedance and admittance parameters	3	CO4
4.2	Hybrid and Transmission parameters	2	CO4
4.3	Inter relation and interconnection of networks	2	CO4

4.4	Duality	2	CO4
5.0	Three Phase Circuits		
5.1	Balanced, unbalanced star – delta connections	2	CO5
5.2	Power measurement	2	CO5
6.0	Coupled Circuits		
6.1	Mutual Inductance, Dot rule in coupled circuit	2	CO6
6.2	Energy in coupled circuits	2	CO6
	TOTAL	36	

8. Course Designer(s):

1. Dr. C. K. Babulal, Professor, EEE, ckbeee@tce.edu
2. Dr. R. Rajan Prakash, Associate Professor, EEE, r_rajanprakash@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

26EREA0	PYTHON PROGRAMMING
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Category	L	T	P	Credits	TE Type
ESC	2	0	2	3	TCP-T

1. Preamble

This course introduces students to computational thinking and problem-solving using Python programming. The course covers fundamental programming concepts, data structures, modular programming, file processing, exception handling, algorithmic thinking, and numerical computing using NumPy. It enables students to develop efficient programs for engineering and scientific applications.

2. Prerequisite

NIL

3. Course Outcomes

On 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 Python fundamentals, data types, operators, and programming constructs.	TPS2	PI 1.4.1	10%	NC	0
CO2	Apply decision-making and iterative control structures to solve computational problems.	TPS3	PI 2.4.1	18%	NC	0
CO3	Utilize strings, lists, tuples, sets, and dictionaries for data manipulation and storage.	TPS3	PI 3.1.2	18%	NC	0
CO4	Develop modular programs using functions, recursion, file handling, and exception handling.	TPS3	PI 3.2.1	18%	NC	0
CO5	Implement searching, sorting, and algorithmic problem-solving techniques using Python.	TPS3	PI 4.2.1	18%	NC	0
CO6	Apply NumPy and scientific computing	TPS3	PI 2.2.1	18%	NC	0

	concepts to solve engineering problems.					
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4. Assessment Pattern

CO	Theory		Practical		Terminal Exam
	CAT1	CAT2	OCR/ Continuous Assessment	Model Test CO-wise	-THEORY
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20		10	10	10
CO2	40		20	18	18
CO3	40		20	18	18
CO4		40	20	18	18
CO5		40	20	18	18
CO6		20	10	18	18
Total	100	100	100	100	100

5. Assessment Pattern: Practical Component

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

6. Syllabus

Introduction to Python Programming: Programming concepts, problem solving, Python environment, online IDE, Python syntax, comments, variables, data types, type conversion, input/output operations and formatted printing.

Operators and Control Structures: Arithmetic, relational, logical operators, operator precedence, conditional statements, nested conditions, looping constructs, range(), break, continue and nested loops.

Strings and Collections: String operations, indexing, slicing, string methods, lists, list operations, tuples, sets, dictionaries, collection manipulation techniques.

Functions and File Processing: Functions, parameters, return values, scope, recursion, file handling, reading and writing files, exception handling, debugging techniques.

Problem Solving and Algorithms: Algorithm design, pseudocode, searching techniques, sorting techniques, computational thinking and program optimization.

Numerical Computing with NumPy: Introduction to NumPy, arrays, indexing, engineering applications and mini-project development.

7. Text Book

1. Reema Thareja, **"Python Programming: Using Problem Solving Approach"**, Oxford University Press, Second Edition, 2024.
2. Allen B. Downey, **"Think Python: How to Think Like a Computer Scientist"**, Third Edition, O'Reilly Media, 2024.

8. Reference Books & web resources

1. John V. Guttag, **"Introduction to Computation and Programming Using Python"**, Third Edition, MIT Press, 2021.
2. Y. Daniel Liang, **"Introduction to Programming Using Python"**, Pearson Education, Second Edition, 2023.
3. Paul Barry, **"Head First Python"**, Third Edition, O'Reilly Media, 2023.
4. Wes McKinney, **"Python for Data Analysis"**, Third Edition, O'Reilly Media, 2022.
5. Jake VanderPlas, **"Python Data Science Handbook"**, O'Reilly Media, 2023.

9. Course Contents and Lecture Schedule

Module No	Topics	No of Periods	Course Outcomes
1	Introduction to Python Programming	4	
1.1	Programming concepts and Python environment	1	CO1
1.2	Variables and data types	1	CO1
1.3	Input, output and type conversion	1	CO1
1.4	Python syntax and basic program development	1	CO1
2	Operators and Control Structures	5	
2.1	Arithmetic, relational and logical operators	1	CO2
2.2	Operator precedence and expressions	1	CO2
2.3	Conditional statements	1	CO2
2.4	Looping constructs	1	CO2

2.5	Nested loops and control statements	1	CO2
3	Strings and Collections	4	
3.1	String operations and methods	1	CO3
3.2	Lists and list manipulation	1	CO3
3.3	Tuples and sets	1	CO3
3.4	Dictionaries and applications	1	CO3
4	Functions, Recursion, File Handling and Exception Handling	4	
4.1	Functions and scope	1	CO4
4.2	Recursion	1	CO4
4.3	File handling	1	CO4
4.4	Exception handling	1	CO4
5	Problem Solving and Algorithms	3	
5.1	Algorithm design and pseudocode	1	CO5
5.2	Linear and binary search	1	CO5
5.3	Bubble sort and applications	1	CO5
6	NumPy and Engineering Applications	4	
6.1	Introduction to NumPy arrays	1	CO6
6.2	Array operations and statistics	1	CO6
6.3	Matrix operations and reshaping	1	CO6
6.4	Engineering applications and mini-project	1	CO6
	Total Periods	24	

10. List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Programs using variables, data types and I/O	1	3	CO1
2	Programs using operators and expressions	1	3	CO1, CO2
3	Decision making and looping applications	2	4	CO2
4	String processing applications	2	4	CO3

5	List, tuple, set and dictionary applications	2	4	CO3
6	Function development and recursion programs	2	3	CO4
7	File processing and exception handling	2	4	CO4
8	Searching and sorting implementations	3	3	CO5
9	NumPy array operations	3	4	CO6
10	Mini project using Python and NumPy	3	5	CO5, CO6

A possible set of applications may be:

- a. Student Record Management System
- b. Library Management System
- c. Inventory Management System
- d. Employee Payroll Processing System
- e. Banking Transaction Management System
- f. Course Registration and Enrollment System
- g. Online Quiz and Assessment System
- h. Personal Expense Tracker
- i. Attendance Monitoring System
- j. Weather Data Analysis System
- k. Electricity Bill Calculation System
- l. Hospital Patient Management System
- m. Sales and Revenue Analysis System
- n. Scientific Calculator

11. Course Designer(s):

Dr.B.Ashok Kumar, Associate Professor, EEE
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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

26ERCB0	ELECTRIC CIRCUIT ANALYSIS LABORATORY
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Category	L	T	P	Credit
PCC	0	0	3	1.5

1. Preamble

This laboratory course provides practical exposure to fundamental electrical circuit concepts, circuit theorems, transient analysis, and power measurement techniques. Students verify key laws and theorems through both simulation and hardware-based experiments to strengthen conceptual understanding and analytical skills. Experiments on transient response and three-phase power measurement enhance understanding of dynamic and industrial electrical systems. The course also introduces basic house wiring practices and electrical safety procedures. Emphasis is placed on measurement techniques, instrument handling, teamwork, and technical report preparation.

2. Prerequisite

- Nil

3. Course Outcomes

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

CO	CO Statement	TPS Level	PI	Objective	SDG Addressed	SDG Level
CO1	Operate appropriate instruments to measure resistance, inductance, and capacitance of passive components and electrical parameter .	TPS 3	5.2.1	1 – Instrumentation	NC	
CO2	Analyse electrical circuits using fundamental laws and network theorems through simulation tools and verify their performance using practical circuit implementations.	TPS 4	2.3.1	2 – Models	NC	
CO3	Examine transient response data of first-order and second-order circuits to quantify time constants and natural frequencies and compare against analytical values.	TPS 4	4.3.1	4 – Data Analysis	NC	
CO4	Demonstrate safe wiring practices and correct use of measuring instruments while assembling and testing household and three-phase power circuits.	TPS 3	5.2.1	6 – Psychomotor Skills	NC	

CO5	Implement assigned team roles equitably across circuit assembly, measurement, simulation, and report preparation activities.	TPS 3	8.2.1	12 – Teamwork	NC	
CO6	Prepare structured laboratory reports communicating circuit diagrams, experimental methodology, simulated and hardware results, and justified conclusions.	TPS 3	9.1.2	11 – Communication	NC	
CO7	Apply electrical safety protocols and energy-conscious practices consistently throughout all circuit experiments.	TPS 3	6.4.1	10 – Safety; 13 – Ethics	07	02

4. Assessment Pattern: Cognitive Domain

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-laboratory, In-laboratory, Post-laboratory	75	Conducted throughout the semester. As per details given in the guidelines.
Model Test	CO-wise (Cognitive, Psychomotor, Affective)	25	Rubrics considering all three domains
Total Internal Marks		100	
End Semester Examination	CO-wise (Cognitive, Psychomotor, Affective)	100	Rubrics considering all three domains

5. List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	COs Addressed
1	Study and Measurement of Resistance, Inductance, and Capacitance	1	CO1, CO4, CO7
2	Study and Implementation of Basic House Wiring Circuits	1	CO4, CO6, CO7

3	Verification of Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) using Simulation and Hardware Circuits	2	CO2, CO5
4	Verification of Mesh and Nodal Analysis Techniques	2	CO2, CO5
5	Verification of Superposition Theorem	2	CO2, CO6
6	Verification of Thevenin's and Norton's Theorems	2	CO2, CO6
7	Analysis of First-Order Transient Response in Electrical Circuits	2	CO3, CO5
8	Analysis of Second-Order Transient Response in Electrical Circuits	2	CO3, CO6
9	Measurement of Three-Phase Power	2	CO1, CO7
10	Series Resonance	2	CO1, CO7

6. Course Designer(s):

1. Dr. C.K. Babulal, Professor, EEE, ckbeeee@tce.edu
2. Dr. R. Rajan Prakash, Associate Professor, EEE, r_rajaprakash@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, photocolourimetry, 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 corrective measures to improve analytical accuracy.	TPS 4	4.3.1	SDG 9 – Industry, Innovation and Infrastructure	2

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
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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, Psychomotor Skills	CO2, CO3, CO5
6	Estimation of Acid Strength in Citrus Fruit	Level 1	Experimentation, Data Analysis,	CO2, CO3, CO5, CO6

			Psychomotor Skills	
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
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Dr. B. Shankar, Assistant Professor, Chemistry	bsrchem@tce.edu
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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 (வவளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
- கணித் தமிழ் – முனைவர் இல சுந்தரம் (விகடன் பிரசுரம்)
- கீழடி – னவனக நதிக்கனரயில் சங்ககால நாகரீகம் (வதால்லியல் துனை வவளியீடு)
- வபாருனந ஆற்றைங்கனர நாகரீகம் (வதால்லியல் துனை வவளியீடு)
- 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 TamilStudies.
- Historial Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu)) Published by: International Institute of TamilStudies.
- The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) Published by: International Institute of TamilStudies
- Keeladi – Sangam City Civilization on the banks of river Vaigai (Jointly Published Department of Archaeology & Tamil Nadu Text Book and Educational Services 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 Civilization 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 – Dravidian 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 & jainism 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 Sculpture – Bronze icons – tribes and their handicrafts – Art of Temples car making	1
2.2	Massive Terracotta Sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments	1
2.3	Mridhangam, Parai, Veenai, Yath 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 puppetry,	1
3.3	Silambattam, Valari, Tiger dance-Sports and Games of Tamils.	1
4	THINAI CONCEPT OF TAMILS	
4.1	Flora and Fauna of Tamils & Aham and Puram Concept for Tholkappiam and Sangam Literature	1
4.2	Aham 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 Conquest 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 Influence 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

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI-625015**B.E. (ELECTRICAL AND COMPUTER ENGINEERING)****SCHEME OF EXAMINATIONS**

(For the candidates admitted from 2026- 27 onwards)

SECOND SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment	Terminal Exam	Max. Marks	Terminal Exam	Total
THEORY								
1	26ERSD0	Matrices and Linear Algebra	3	40	60	100	27	50
2	26PHSA0	Physics	3	40	60	100	27	50
3	26ERCC0	Electronic Devices and Circuits	3	40	60	100	27	50
4	26EREC0	Linear Integrated Circuits	3	40	60	100	27	50
5	26CCEB0	Biology for Engineers	3	40	60	100	27	50
THEORY CUM PRACTICAL								
6	26ERCD0	Software Engineering	3	40	60	100	27	50
PRACTICAL								
7	26PHSB0	Physics Laboratory	3	60	40	100	18	50
8	26ERCE0	Electronic Devices and circuits Laboratory	3	60	40	100	18	50
AUDIT COURSES								
9	26TAAB0	Tamils and Technology	-	-	-	-	-	-
10	26CCAB0	Foundations of Problem Solving-1	-	-	-	-	-	-

26ERSD0	MATRICES AND LINEAR ALGEBRA
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Category	L	T	P	Credit
BSC	3	0	0	3

1. Preamble

Matrices and Linear Algebra form the mathematical foundation for modelling and solving engineering problems involving systems, transformations, and data representation. This course develops analytical techniques in matrix theory, vector spaces, and linear transformations that are essential in electrical network analysis, computational algorithms, and machine learning applications. It also provides the basis for advanced engineering tasks such as dimensionality reduction, optimization, and signal processing.

2. Prerequisite

- Nil

3. Course Outcome

CO	Course Outcomes	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Solve systems of linear equations arising in engineering and scientific applications using matrix methods and row reduction techniques.	TPS3	1.1.1	13%	SDG4	2
CO2	Demonstrate vector space, identify the basis, row space, column space, null space, and dimension of a vector space.	TPS3	1.1.1	20%	SDG4	2
CO3	Demonstrate linear transformations and represent them through matrices to analyze mappings in engineering systems.	TPS3	1.1.1	17%	SDG4	2
CO4	Compute the orthogonal subspaces to solve least square problems	TPS3	1.1.1	13%	SDG4	2
CO5	Compute orthonormal bases for inner product spaces using the Gram–Schmidt orthogonalization process.	TPS3	1.1.1	17%	SDG4	2

CO6	Calculate the eigenvalues, Eigenvectors, and Quadratic forms for matrix diagonalization and system characterization.	TPS3	1.1.1	20%	SDG4	2
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4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	26	26			13
CO2	40	40			20
CO3	34	34			17
CO4			26	26	13
CO5			34	34	17
CO6			40	40	20
Total	100	100	100	100	100

5. Syllabus

Matrices and System of Linear Equations: System of Linear Equations – Equivalent Systems - Row Echelon Form – Overdetermined – Reduced Row Echelon Form – Underdetermined Systems – Applications: Traffic Flow, Electric Networks

Vector Spaces: Definition and Examples – Subspaces - Linear Independence – Basis and Dimension – Row space and Column space – Rank Nullity theorem

Linear Transformations: Linear Transformations: Definitions and Examples – Matrix Representation of Linear Transformations - Similarity of transformations

Orthogonality: The Scalar product in $\mathbb{R}^n$ - Orthogonal subspaces – Least square problems

Inner Product Spaces: Inner Product Spaces – Orthonormal sets – The Gram-Schmidt Orthogonalization Process - QR-Factorization.

Matrix Eigen Value Problem: Eigenvalues and Eigenvectors – Diagonalization - Singular Value Decomposition - Quadratic forms

6. Learning Resources

6.1 Text Book

1. Steven J. Leon., “Linear Algebra with Applications”, 10th Edition, Pearson, 2021.

Module 1: [1.1, 1.2]

Module 2: [3.1, 3.2, 3.3, 3.4, 3.6]

Module 3: [4.1, 4.2, 4.3]

Module 4: [5.1, 5.2, 5.3]

Module 5: [5.4, 5.5, 5.6]

Module 6: [6.1, 6.3, 6.5, 6.6]

6.2 Reference Books & Web Resources

1. David C. Lay, Steven R. Lay and Judi J. McDonald, "Linear Algebra and its applications", 5th edition, Pearson, 2016.
2. Richard Bronson., "Schaum's Outline of Matrix Operations" Second Edition, McGraw Hill Publications. 2015.
3. Gilbert Strang., "Introduction to Linear Algebra", 5th Edition, 2016
4. NPTEL course: Applied Linear Algebra, IIT Madras, <https://nptel.ac.in/courses/108106171>
5. MIT Course: Linear Algebra, G. Strang, <https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/pages/instructor-insights/>

7. Course Contents and Lecture Schedule

Module No.	Topics	No of Periods
1	Matrices and System of Linear Equations	
1.1	System of Linear Equations – Equivalent Systems	1
1.2	Row Echelon Form – Overdetermined Systems	1
	Tutorial	1
1.3	Reduced Row Echelon Form – Underdetermined Systems	1
1.4	Traffic Flow, Electric Networks	1
2	Vector Spaces	
	Tutorial	1
2.1	Definition and Examples	1
2.2	Subspaces, Linear independence	1
	Tutorial	1
2.3	Basis and Dimension, Row space and Column space	1
2.4	Rank-Nullity Theorem	1
	Tutorial	1
3	Linear Transformations	
3.1	Definitions and Examples	1
3.2	Matrix Representation of Linear Transformations	1
	Tutorial	1
3.3	Similarity of transformations	2
	Tutorial	1
4	Orthogonality	
4.1	The Scalar product in $\mathbb{R}^n$	1

4.2	Orthogonal Subspaces	1
	Tutorial	1
4.3	Least square problems	1
	Tutorial	1
5	Inner Product Spaces	
5.1	Inner Product space	1
5.2	Orthonormal sets	1
	Tutorial	1
5.3	The Gram-Schmidt Orthogonalization Process	1
5.4	QR-Factorization	1
	Tutorial	1
6	Matrix Eigen Value Problem	
6.1	Eigenvalues and Eigenvectors	1
6.2	Diagonalization	1
	Tutorial	1
6.3	Singular Value Decomposition	2
	Tutorial	1
6.4	Quadratic forms	1
	Total Periods	36

8. Course Designer(s)

1. Dr. P. Krishnapriya, Assistant Professor, Dept. of Mathematics, pkamat@tce.edu
2. Dr. P. Balamanikandan, Assistant Professor, Dept. of Mathematics, pbummat@tce.edu
3. Dr. A. Muneesh Kumar, Assistant Professor, Dept. of Mathematics, amkmat@tce.edu

26PHSA0	PHYSICS (COMMON TO ALL BRANCHES)
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Category	L	T	P	Credit
BSC	2	1	0	3

1. Preamble

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

2. Prerequisite

Physics and Mathematics at Higher Secondary Level (Class XII)

3. Course Outcomes

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

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

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

4. Assessment Pattern

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

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

5. Syllabus

Module 1: Mechanics of Solids (6 hrs)

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

Module 2: Oscillations and Waves (6 hrs)

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

Module 3: Electrodynamics (6 hrs)

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

Module 4: Physics of Electronic Materials (6 hrs)

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

Module 5: Quantum Mechanics (6 hrs)

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

Module 6: Quantum Computing (6 hrs)

Quantum Computing – Classical and Quantum Computing: Key Differences – Bloch Sphere Representation of Qubits – Types of Qubits – Superposition – Quantum Entanglement – Quantum Logic Gates.

6. Learning Resources

6.1 Text Book

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

6.2 Reference Books & Web resources

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

7. Course Contents and Lecture Schedule

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

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

SDG-Aligned Academic Activities

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

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

8. Course Designer(s):

Dr. M. Mahendran
Dr. M. Tamilelakkiya
Dr. S. Karthickprabhu

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26ERCC0	ELECTRONIC DEVICES AND CIRCUITS
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Category	L	T	P	Credit
PCC	3	0	0	3

1. Preamble

This course provides a foundation in the principles and operation of essential electronic devices and circuits. It introduces the analysis and design of basic electronic circuits used for rectification, amplification, filtering, voltage regulation, and signal processing applications. The course enables students to develop the knowledge and skills necessary to understand and apply electronic circuits in practical engineering systems and emerging technologies.

2. Prerequisite

- Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain the characteristics and applications of diode and special diodes	TPS2	1.3.1	20%	NC	
CO2	Design diode base circuits for the given specifications	TPS3	2.1.2	10%	NC	
CO3	Design BJT based circuits for the given specifications	TPS3	2.1.2	20%	NC	
CO4	Design MOSFET based circuits for the given specifications	TPS3	2.1.2	20%	NC	
CO5	Design feedback amplifiers and oscillators for the given specifications	TPS2	1.4.1	10%	NC	
CO6	Design feedback amplifiers and oscillators for the given specifications	TPS3	2.4.1	10%	NC	

CO7	Explain the operation of Opto-electronic devices	TPS2	1.4.1	10%	NC	
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Note: TPS Level (TPS1–TPS5), PI format (x.y.z), Total CO Weightage = 100%

5. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	40				20
CO2	20	50			10
CO3	40	50			20
CO4			40	50	20
CO5			20		10
CO6			20	50	10
CO7			20		10
Total	100	100	100	100	100

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

5. Syllabus

Diode: Semiconductor – Types, Drift and Diffusion currents, Diode operation, Voltage-Current Characteristics, Current equation, Parameters and equivalent circuit, Load line analysis, Transition and Diffusion capacitance, Reverse recovery characteristics.

Wave shaping circuits: Rectifiers, Clippers and Clampers.

Special Diodes: Zener diode, Varactor diode, Schottky Diode and their application - Selection of diode using data sheets for the given application.

BJTs: Operation of NPN and PNP transistor, Characteristics of BJT in CB, CE and CC configurations, DC and AC load line analysis, Fixed, Emitter feedback and Voltage divider bias, Stability factor, Application of BJT as amplifier, BJT as switch, Switching characteristics of BJT, Low frequency and high frequency hybrid model, AC analysis of BJT CE amplifier, Selection of BJT using data sheets for the given application.

MOSFETs: Introduction to JFET, Construction, Operation, Characteristics and Parameters of MOSFET, MOSFET as a voltage controlled resistor, Voltage divider bias in MOSFET CS amplifier, Small signal model of MOSFET, AC analysis of MOSFET CS amplifier, Selection of MOSFET using data sheets for the given application, Introduction to FinFET.

Power Amplifiers: Construction and operation of Class A, B, C and D amplifiers.

Feedback amplifiers and Oscillators: Positive and negative feedback, Feedback amplifiers, Gain and frequency response, Oscillators – Colpitts, Hartley and Crystal oscillator.

Opto-electronic Devices: Photo diode, Photo transistor, LED, LCD, Laser diode, Opto-couplers, IR Emitter and Detector

6. Learning Resources

6.1 Text Book

1. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 11th Edition, Pearson Education, 2013.
2. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Prentice Hall India, 2010.

6.2 Reference Books & Web resources

1. Floyd T.L., "Electronic Devices", 10th Edition, Pearson Education, 2017.
2. Albert Malvino and David J.Bates, "Electronic Principles", 7th Edition, Tata Mc-Graw Hill, 2017.
3. Jacob Millman, Halkias C.C and Satyabrata Jit, "Electronic Devices and Circuits", 4th Edition, Tata Mc-Graw Hill, 2012.
4. Sedra A.S. and Smith K.C, "Microelectronic Circuits", 7th Edition, Oxford press, 2014.
5. Donald A.Neamen, "Electronic circuit analysis and design", Second edition, Tata Mc-Graw Hill, 2003.
6. VK.Mehta and Rohit Mehta, "Principles of Electronics", S.Chand and Company, 11th Edition, 2008.

7. Course Contents and Lecture Schedule

S.No.	Topics	No.of Lectures
1.	Diode	
1.1	Semiconductor–Types, Drift and Diffusion currents	1
1.2	Operation, V-I Characteristics, Current equation, Parameters and equivalent circuit	1
1.2	Load line analysis, Transition and Diffusion capacitance, Reverse recovery Characteristics	1
1.3	Application of Diodes – Rectifiers	2
1.4	Clippers and Clampers	2
2.	Special Diodes	
2.1	Zener diode, Varactor diode, Schottky Diode and their application	1
2.2	Selection of diode using data sheets for the given application.	1
3.	BJTs	

3.1	Operation of NPN and PNP transistor, Characteristics of BJT in CB, CE and CC configurations	2
3.2	DC & AC load line, Fixed and Emitter feedback bias	2
3.3	Voltage divider bias, Stability factor	1
3.4	Application of BJT as amplifier and switch	1
3.5	Switching characteristics of BJT	1
3.6	Low frequency and high frequency hybrid model, AC analysis of BJT CE amplifier – Selection of BJT using data sheets for the given application	2
4.	MOSFETs	
4.1	Introduction to JFET, Construction, Operation, Characteristics and Parameters of MOSFET	2
4.2	MOSFET as a voltage controlled resistor, Voltage divider bias in MOSFET CS amplifier	2
4.3	Small signal model of MOSFET- AC analysis of MOSFET CS amplifier	2
4.4	Selection of MOSFET using data sheets for the given application	1
4.5	Introduction to FinFET	1
5.	Power Amplifiers	
5.1	Construction and operation of Class A, B, C and D amplifiers	2
6.	Feedback amplifiers and Oscillators	
6.1	Positive and negative feedback	1
6.2	Feedback amplifiers- Gain and frequency response	1
6.3	Oscillators – Colpitts, Hartley and Crystal oscillator	1
6.4	Design of Oscillators	2
7.	Opto-electronic Devices	
7.1	LED, LCD	1
7.2	Laser diode, Photo-diode Photo-transistor	1
7.3	Opto-couplers, IR Emitter and Detector	1
	Total	36

8. Course Designer(s):

- | | | |
|------------------------------|----------------|-----------------|
| 1. Dr. M.Saravanan, | Professor, EEE | mseeee@tce.edu |
| 2. Dr. V.Suresh Kumar, | Professor, EEE | vskeee@tce.edu |
| 3. Dr.S.Arockia Edwin xavier | Professor, EEE | saexeee@tce.edu |

26ERCD0	SOFTWARE ENGINEERING
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Category	L	T	P	Credits	TE Type
PCC	3	-	2	4	TCP-T

1. Preamble

This subject is to promote the practice of software engineering concepts at a higher level of abstraction, in a more engineering-like fashion. This course is to impart knowledge on various software development models and processes that are used by professionals for designing and developing the software.

2. Prerequisite

NIL

3. Course Outcomes

On 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 software engineering concepts, life cycle models, and software quality principles in software development.	TPS2	PI 1.4.1	14%	SDG 4	1
CO2	Apply software project management techniques to perform feasibility analysis, effort estimation, scheduling, risk management, and configuration management.	TPS3	PI 2.4.1	18%	SDG 8	2
CO3	Utilize software quality and reliability models, process maturity frameworks, and software metrics to evaluate software products and processes.	TPS3	PI 4.2.1	18%	SDG 9	2
CO4	Demonstrate requirement elicitation techniques, UML concepts, and software construction principles to develop software requirement specifications and design models.	TPS3	PI 3.1.2	18%	SDG 9	2
CO5	Implement object-oriented design principles, design patterns, refactoring techniques, and	TPS3	PI 3.2.1	18%	SDG 4	2

	software testing methodologies to develop reliable software systems.					
CO6	Use domain knowledge frameworks and problem-space understanding concepts in knowledge-driven software development for real-world applications.	TPS3	PI 2.2.1	14%	SDG 8	2

4. Assessment Pattern

CO	Theory		Practical		Terminal Exam
	CAT1	CAT2	OCR/ Continuous Assessment	Model Test CO-wise	-THEORY
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20		10	10	14
CO2	40		20	20	18
CO3	40		20	20	18
CO4		40	20	20	18
CO5		40	20	20	18
CO6		20	10	10	14
Total	100	100	100	100	100

5. Assessment Pattern: Practical Component

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

6. Syllabus

Introduction: Introduction: Programming in the small Scale vs. large scale; Importance of software quality and timely availability; engineering approach to software development; role of

software engineering towards successful execution of large software projects; software project failures; emergence of software engineering as a discipline

Software Project Management: Software Project Management: Basic concepts of life cycle models – different models and milestones; software project planning –identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.

Software Quality and Reliability: Internal and external qualities of software ; process and product quality; principles to achieve software quality; introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126; introduction to Capability Maturity Models (CMM and CMMI); introduction to software reliability models and estimation

Software Requirements Analysis, Design and Construction: Software Requirements Analysis, Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modeling – decision tables, event tables, state transition tables, Petri nets; introduction to UML diagrams, introduction to software metrics.

Object Oriented Analysis and testing: Object Oriented Analysis, object oriented construction principles; Class Responsibility Collaborator (CRC) model; object oriented metrics. Concepts of design patterns; verification and validation; white box test coverage – code coverage, condition coverage, branch coverage; black-box tests – equivalence classes, boundary value tests, usage of state tables; testing for non-functional requirements

Problem Space Understanding: Problem Space Understanding: How an industry works, how an IT company works, How IT supports business, Knowledge Driven Development (KDD), Domain knowledge framework of KDD, usage of domain knowledge framework in Insurance, Banking and Automobile

7. Text Book

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", 9th Edition, McGraw Hill Education, 2023
2. Ian Sommerville , "Software Engineering" , 10th Edition, John Wiley and sons, 2015.

8. Reference Books & web resources

1. Pankaj Jalote, "Software Engineering: A Precise Approach ", Wiley, 2010
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns: Elements of Object-Oriented Reusable Software", 2015
3. https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_cs68
4. <https://www.coursera.org/specializations/software-engineering>
5. <https://www.uml-diagrams.org/>

9. SDG Alignment

Activity aligned with SDG addressed:

1. SDG4: Case Study to understand how real banking system software uses software engineering principles to develop and test the reliable software systems.
2. SDG8: Apply domain knowledge frameworks to develop software solutions for real-world business applications.
3. SDG9: Develop UML models and SRS documents for real-world industrial applications

10. Course Contents and Lecture Schedule

Module No	Topics	No of Periods	Course Outcomes
1	Introduction	5	
1.1	Programming in the small Scale vs. large scale; Importance of software quality and timely availability;	1	CO1
1.2	Engineering approach to software development;	1	CO1
1.3	Role of software engineering towards successful execution of large software projects;	1	CO1
1.4	Software project failures;	1	CO1
1.5	Emergence of software engineering as a discipline	1	CO1
2	Software Project Management	7	
2.1	Software Project Management: Basic concepts of life cycle models – different models and milestones;	1	CO2
2.2	Software project planning –identification of activities and resources; Concepts of feasibility study;	1	CO2
2.3	Techniques for estimation of schedule and effort;	1	CO2
2.4	Software cost estimation models and concepts of software engineering economics;	1	CO2
2.5	Techniques of software project control and reporting;	1	CO2
2.6	Introduction to measurement of software size;	1	CO2
2.7	Introduction to the concepts of risk and its mitigation; Configuration management.	1	CO2
3	Software Quality and Reliability	6	
3.1	Internal and external qualities of software ; process and product quality;	1	CO3
3.2	Principles to achieve software quality; introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126;	2	CO3
3.3	Introduction to Capability Maturity Models (CMM and CMMI);	2	CO3
3.4	Introduction to software reliability models and estimation	1	CO3

4	Software Requirements Analysis, Design and Construction	7	
4.1	Software Requirements Analysis, Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques;	2	CO4
4.2	Techniques for requirement modeling – decision tables, event tables	2	CO4
4.3	State transition tables, Petri nets;	1	CO4
4.4	Introduction to UML diagrams,	1	CO4
4.5	Introduction to software metrics	1	CO4
5	Object Oriented Analysis and testing	7	
5.1	Object Oriented Analysis, object oriented construction principles;	1	CO5
5.2	Class Responsibility Collaborator (CRC) model; object oriented metrics.	1	CO5
5.3	Concepts of design patterns;	1	CO5
5.4	Verification and validation; White box test coverage – code coverage, condition coverage, branch coverage;	2	CO5
5.5	Black-box tests – equivalence classes, boundary value tests, usage of state tables; testing for non-functional requirements	2	CO5
6	Problem Space Understanding	4	
6.1	Problem Space Understanding: How an industry works, how an IT company works, How IT supports business,	1	CO6
6.2	Knowledge Driven Development (KDD), Domain knowledge framework of KDD	2	CO6
6.3	Usage of domain knowledge framework in Insurance, Banking and Automobile,	1	CO6
	Total Periods	36	

11. List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Collect the requirements and Identify project scope, Objectives, deliverables	2	5	CO1, CO2, CO4

2	Identify the individual Phases/ modules of the project	2	2	CO1, CO2, CO4
3	Develop Class responsibility collaborator(CRC) Model	2	2	CO4, CO5
4	Build a Prototype and develop modules of the project	2	5	CO5, CO6
5	Prepare test plan, perform validation testing, coverage analysis, memory leaks, develop test case hierarchy, Site check and site monitor	3	3	CO3, CO5
6	Track configuration items and document functional dependencies	3	4	CO2, CO3
7	Perform post execution analysis using dynamic program analysis tools	3	4	CO3, CO5, CO6

A possible set of applications may be:

- a. E-Library System
- b. Inventory System
- c. Course Registration System
- d. Quiz System
- e. Student Marks Analyzing System
- f. Reservation Systems for Airlines, Railways etc.
- g. Stock Management System
- h. Real-Time Scheduler
- i. Simulator Software for Parallel Processing Operation

12. Course Designer(s):

1. Dr. P. Suganthi, Associate Professor, Dept. of CSBS,
2. Mr. M. Gowtham Sethupathi, Assistant Professor, Dept. of CSBS,

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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 its short-circuit current (I_{sc}), open-circuit voltage (V_{oc}), 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
Dr. M. Tamilelakkia
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26ERCE0	ELECTRONIC DEVICES AND CIRCUITS LABORATORY
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Category	L	T	P	Credits
PCC	-	-	3	1.5

1. Preamble

This laboratory gives a practical exposure to the students to learn the characteristics of various electronic devices such as diodes, BJT, and MOSFET that are used nowadays in most of the electronic circuits. The students also learn the design and the construction of different electronic circuits based on the above electronic devices. To validate the experimental results, the use of simulation tools for the performance analysis of the circuits is also introduced to the students

2. Prerequisite

- NIL

3. Course Outcomes

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

CO	CO Statement	TPS Level	PI	Objective	SDG Addressed	SDG Level
CO1	Determine the equivalent circuit parameters of the given Diode, BJT, and MOSFET	TPS 3	5.2.1	1	7	2
CO2	Design voltage regulator using Zener diode for the given specifications	TPS 3	4.3.1	4	7	2
CO3	Analyze the performance of the diode rectifier circuit with and without filter designed for the given specifications.	TPS 4	4.3.1	4	7	2
CO4	Analyze the performance of the wave shaping circuits (Clippers and Clampers) designed for the given specifications	TPS 4	8.2.1	4	7	2
CO5	Analyze the performance of the amplifier and oscillator designed for the given specifications	TPS 4	7.1.2	4	7	2
CO6	Analyze the performance of the analog device characteristics and analog circuits using simulation tools	TPS 4	7.2.1	4	7	2

4. Assessment Pattern: Cognitive Domain

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-laboratory, In-laboratory, Post-laboratory	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

5. List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	COs Addressed
1.	Characteristics of PN junction diode, Zener diode	01	CO1
2.	Characteristics of BJT and MOSFET	01	CO1
3.	Design of voltage regulator using Zener diode	02	CO2
4.	Design of Full wave rectifier with and without filter	02	CO3
5.	Design of wave shaping circuits (clippers and clampers)	02	CO4
6.	Design of BJT-CE amplifiers and LC Oscillators	02	CO1, 5
7.	Mini projects	03	All COs
8.	Analyze the performance of different electronic circuits using PSPICE/PSIM/Simulink	02	CO6

6. Course Designer(s):

1. Dr. M.Saravanan,	Professor, EEE	mseeee@tce.edu
2. Dr. V.Suresh Kumar,	Professor, EEE	vskeee@tce.edu
3. Dr.S.Arockia Edwin xavier	Professor, EEE	saexeee@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 during Sangam Age Structural Construction 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	Agriculture and Agro Processing 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.

Module 2:

Designing and Structural Construction House & Designs in Household materials during Sangam Age – Building materials and Hero stone of Sangam age – Details of Stage Constructions in Silappathikaram – sculptures and Temples of Mamallapuram- Great Temples of Cholas and other Worship places- Temples of Nayaka Period- Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal – Chetti Nadu House, Indo-Saracenic Architecture at Madras during British Period.

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 beads – Archeological evidences- Gem stone types described in Silappathikaram.

Module 4:

Dam, Tank, Ponds, Stairs, Signification of Kumizhi Thoopu of Chola Period, Animal Husbandry- Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries- Pearl-Conch diving –Ancient Knowledge of Ocean – Knowledge Specific 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 தமிழ்நாடு :வவளியீடு)
பண்பாடும் (மற்றும் கல்வியியல் பாடநூல்
பணிகள் கழகம்
- கணித் தமிழ் – முனைவர் இல.சுந்தரம் விகடன் பிரசுரம்(
- கீழடி – னவனக நதிக்கனரயில் சங்ககால நாகரீகம் வதால்லியல்
துனை) (வவளியீடு)
- வபாருனந ஆற்றைங்கனர நாகரீகம் (வதால்லியல் துனை வவளியீடு)
- 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 TamilStudies.
- Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu))
Published by: International Institute of TamilStudies.
- The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) Published by:
International Institute of TamilStudies.
- Keeladi – Sangam City Civilization on the banks of river Vaigai (Jointly Published
Department of Archaeology & Tamil Nadu Text Book and Educational Services
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 Civilization from Indus to Vaigai (R.Balakrishnan) Published by: RMRL – Reference Book

2. Course Contents and Lecture Schedule

Module No.	Topics	No. of Periods
1	WEAVING AND CERAMIC TECHNOLOGY	
1.1	Weaving Industry Sangam Age – Ceramic Technology	1
1.2	Black and Red Ware Potteries (BRW)	1
1.3	Graffiti on Potteries.	1
2	DESIGN AND CONSTRUCTION TECHNOLOGY	
2.1	Designing and Structural Construction House & Designs in Household materials during Sangam Age – Building materials and Hero stone of 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 Period.	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 beads	1
3.3	Archaeological evidences- Gem stone types described in Silappathikaram.	1
4	AGRICULTURE AND IRRIGATION TECHNOLOGY	
4.1	Dam, Tank, Ponds, Stairs, Signification of Kumizhi Thoompu of Chola Period	1
4.2	Animal Husbandry- Wells designed for cattle use – Agriculture and Agro Processing	1
4.3	Knowledge of Sea – Fisheries- Pearl-Conch diving – Ancient Knowledge of Ocean – Knowledge Specific Society.	1
5	SCIENTIFIC TAMIL & TAMIL 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](mailto:mabutce@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

26ERCH0	DIGITAL SYSTEMS
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Category	L	T	P	Credits
PCC	4	0	0	4

1. Preamble

This course introduces the fundamental concepts of digital systems design, encompassing the theoretical principles of binary logic and the practical architecture of modern computing devices. Students will explore Boolean algebra, combinational and sequential circuit optimization, and the design methodologies used to implement finite state machines and programmable logic devices. By bridging foundational logic with hardware realization, the curriculum provides the essential engineering tools required to design efficient, reliable microprocessors and contemporary digital infrastructure.

2. Prerequisite:

- Nil

3. Course Outcome

CO	Course Outcomes	TPS Level	PI	CO Weightage	SDG addressed	SDG Level
CO1	Explain different number systems, codes, code converters and digital logic families	TPS2	1.3.1	20	4	1
CO2	Design combinational circuits for the given applications using logic gates and standard combinational circuits (multiplexers and de multiplexers, adders, subtractors, Encoders and Decoders)	TPS3	1.4.1	30	9	1
CO3	Design synchronous sequential circuits for the given requirement including counters and sequence detectors	TPS3	1.4.1	20	9	1
CO4	Explain the characteristics and working of asynchronous sequential logic circuits	TPS2	1.3.1	10	NC	0
CO5	Implement combinational and sequential circuits using verilog simulation tool	TPS3	1.5.1	10	4	1
CO6	Implement the given digital application using Programmable Logic Devices and illustrate the function of memories.	TPS3	2.1.1	10	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	40				20
CO2	60	100			30
CO3			40	60	20
CO4			20		10
CO5			20	20	10
CO6			20	20	10
Total	100	100	100	100	100

5. Syllabus

Review of Number systems & Boolean Algebra: Decimal, binary, signed binary, octal, hexadecimal number - binary arithmetic, one's and two's complements arithmetic - base conversions - **Codes:** BCD, Excess-3, Gray, ASCII codes, error detecting codes, Boolean Algebra and laws- Simplification of Boolean expressions – Canonical and Standard forms

Logic gates & Logic Families: Logic gates and their truth table. Characteristics of digital ICs, Digital Logic Families - Comparison of RTL, DTL, TTL, ECL and MOS families - Operation of CMOS digital logic family. Examples of IC gates

Combinational logic circuits: Introduction to sum of products (SOP) & product of sums (POS)- Logic Minimization using K-map and their realisation using logic gates. Don't care conditions, Quine-McCluskey method of function realization. Multiplexer, De-Multiplexer, Decoders, Realization of Boolean functions using multiplexers. Adders, Subtractors, Carry look ahead adder, popular MSI chips, Magnitude comparator, parity checker/generator, code converters, priority encoder, decoders/drivers for display devices.

Sequential Logic circuits: Moore and Melay Machines, Latches and Flip-Flops(SR,JK,T,D), State Diagrams, Timing Diagrams and state Tables, Sequential Circuit Design, Shift Registers, Synchronous counters (up, down, up-down, mod-N, Ring). Applications of Counters, Counter ICs (IC7493, IC74161), sequence detectors

Asynchronous Sequential Logic circuits: Characteristics- Racing and Glitches, Hazard-Static and Dynamic. Asynchronous Counters (up, down, Mod-N).

Introduction to Verilog simulation tool: Verilog code for combinational and sequential circuits

Memory & Programmable logic devices: RAM (static and dynamic), ROM (EEPROM, FLASH), Programmable Logic Array (PLA), Programmable Array Logic(PAL) Introduction to CPLD and FPGA

6. Learning Resources**6.1 Text Book**

1. M.Morris Mano and Michael D.Ciletti, Digital Design, Sixth Edition, Pearson Prentice Hall, 2022

6.2 Reference Books & Web Resources

1. RP Jain, Modern Digital Electronics, fourth edition, Tata Mcgraw Hill Publishers, 2010
2. Floyd and Jain, Digital Fundamentals, 8th Edition, Pearson Education, 2009
3. Charles H. Roth and Lizy K. John, Digital system design using VHDL, 2nd edition, Cengage learning, 2007
4. Donald Leach, Albert Malvino and Goutam Saha, Digital Principles and Applications, McGraw Hill Publishers, 2010
5. J. F. Wakerly Digital Design Principles and Practices, 4th edition, Prentice Hall of India, 2008.
6. NPTEL course: https://onlinecourses.nptel.ac.in/noc18_ee33

7. Course Contents and Lecture Schedule

Module No.	Topics	No. of Hours
1	Review of Number systems & Boolean Algebra:	
1.1	Decimal, binary, signed binary, octal, hexadecimal number - base conversions	2
1.2	Binary arithmetic, one's and two's complements arithmetic, Codes: BCD, Excess-3, Gray	2
1.3	ASCII codes, error detecting codes	1
1.4	Boolean Algebra and laws, Simplification of Boolean expressions, Canonical and Standard forms	1
2	Logic gates & Logic Families:	
2.1	Logic gates and their truth table. Characteristics of digital ICs, Digital Logic Families - Comparison of RTL, DTL, TTL, ECL and MOS families	2
2.2	Operation of CMOS digital logic family. Examples of IC gates	2
3	Combinational logic circuits:	
3.1	Introduction to sum of products (SOP) & product of sums (POS)- Logic Minimization using K-map and their realization using logic gates	3
3.2	Don't care conditions, Quine-McCluskey method of function realization.	2
3.3	Multiplexer, De-Multiplexer	1
3.4	Decoders, Realization of Boolean functions using multiplexers. Adders, Subtractors	2
3.5	Carry look ahead adder, popular MSI chips	1
3.6	Magnitude comparator, parity checker/generator,	2
3.7	Code converters	1

3.8	priority encoder	1
3.9	decoders/drivers for display devices.	1
4	Sequential Logic circuits:	
4.1	Moore and Melay Machines, Latches and Flip-Flops(SR,JK,T,D),	2
4.2	State Diagrams, Timing Diagrams and state Tables,	2
4.3	Sequential Circuit Design	2
4.4	Shift Registers	1
4.5	Synchronous counters (up, down, up-down, Ring).	1
4.6	Applications of Counters , Examples of Counter ICs IC7493, IC74161	2
4.7	Sequence detectors	1
5	Asynchronous Sequential Logic circuits:	
5.1	Characteristics- Racing and Glitches, Hazard- Static and Dynamic	1
5.2	Asynchronous Counters (up, down, Mod-N)	2
6	Introduction to Verilog simulation tool:	
6.1	Verilog code for basic combinational circuits	2
6.2	Verilog code for basic sequential circuits	3
7	Memory & Programmable logic devices:	
7.1	RAM (static and dynamic), ROM (EEPROM, FLASH)	2
7.2	Programmable Logic Array (PLA), Programmable Array Logic(PAL)	2
7.3	Introduction to CPLD and FPGA	1
	Total	48

8. Course Designer(s):

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Electives – Electrical Domain

1.	Electrical Machine Design
2.	FPGA based System Design
3.	Embedded Systems Design
4.	Real Time Operating System
5.	Electric Vehicles
6.	Smart Grid
7.	ASIC Design
8.	VLSI Design
9.	Digital Signal Processing
10.	Industrial Instrumentation
11.	Power Quality
12.	Sensors actuators and signal conditioning

Electives- Computer Domain

1.	Responsible AI
2.	Generative AI
3.	Design and analysis of algorithms
4.	Deep learning
5.	Quantum Computing
6.	Ethical Hacking
7.	Data analytics and visualization
8.	Foundations of block chain technology
9.	Big data analytics
10.	Natural language processing
11.	Cryptography or Network Security
12.	Cloud Computing