CURRICULUM AND DETAILED SYLLABI

FOR

B.E. EEE DEGREE PROGRAMME

FOR THE STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2026-27 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING

(A Government Aided Autonomous Institution affiliated to Anna University)

MADURAI – 625 015, TAMILNADU

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Passed in Board of Studies meeting on 30.05.2026 Approved in 71st Academic Council meeting on 27.06.2026

VISION

Transforming the individuals into globally competent electrical engineers to fulfill the technological needs of the society.

MISSION

Establishing world class infrastructure in Electrical Engineering.
Enhancing the knowledge of the faculty in cutting edge technologies through continuous improvement programmes.
Providing well balanced curriculum in graduate, postgraduate and doctoral programmes.
Adopting innovative content delivery, assessment and continuous improvement methods to achieve desired outcomes.
Facilitating industry institution interaction in teaching & learning, consultancy and research activities to accomplish the technological needs of the society.
Encouraging the faculty and students to carry out innovative research work.
Practicing ethical standards by the faculty and students.
Motivating the students for active participation in co-curricular and extracurricular activities.

Programme Educational Objectives (PEOs)

PEO1: Graduates of the programme will have successful career in chosen technical or professional fields.
PEO2: Graduates of the programme will have technical competency in solving challenging societal tasks in ethical and economical manner.
PEO3: Graduates of the programme will reveal lifelong learning and team work in their chosen profession.

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 analyse 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: Analyse 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 behaviour 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.

Programme Specific Outcomes (PSOs)

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

PSO1: Design and analyze components/ systems that effectively generate, transmit, distribute and utilize electrical power.

PSO2: Design and analyze modern industrial electronic systems/components to perform analog and digital processing and control functions.

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015

B. E./ B.Tech. DEGREE PROGRAMMES

CREDIT DISTRIBUTION

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

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

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SCHEDULING OF COURSES FOR STUDENTS JOINED FROM THE ACADEMIC YEAR 2026-27 ONWARDS

Sem	Theory / Theory cum Practical / Practical											CDIO Courses	Audit Courses	Credit
I	26MASA0 Applied Calculus for Engineers (BSC-4)	26CHSB0 Applied Chemistry (BSC-3)	26EGHA0 Technical English (TCP) (HSMC-3)	26EECA0 Electric Circuit Analysis (PCC-3)	26MEEA0 Engineering Graphics (TCP) (ESC-3)				26EECB0 Electric Circuit Analysis Laboratory (PCC-1.5)	26CHSC0 Chemistry Laboratory (BSC-1.5)		26CCEA0 Introduction to Engineering (TCP) (ESC-2)	26TAAA0 Heritage of Tamils (AC-0) 26CCAA0 Vision and Speed Maths (AC-0)	21
II	26EESA0 Numerical Techniques and Transforms (BSC -3)	26PHSA0 Physics (BSC-3)	26EEEA0 Electromagnetic Field Theory (ESC-3)	26EECC0 Digital Systems (PCC-4)	26EECD0 Electronic Devices and Circuits (PCC-3)				26CCEB0 Biology for Engineers (ESC-3)	26PHSB0 Physics Laboratory (BSC-1.5)	26EECE0 Electronic Devices and Circuits Laboratory (PCC-1.5)		26TAAB0 Tamils and Technology (AC-0) 26CCAB0 Foundations of Problem Solving-1 (AC-0)	22
III	26EESB0 Linear Algebra, Probability and Statistics (BSC -3)	26CCLA0 Building Communication Skills (EEC-1)	26EECF0 DC Machines and Transformers (PCC- 3)		26EECG0 Signals and Systems (PCC-3)	26EEEB0 C Programming TCP (ESC-3)	26EECH0 Power Electronics (PCC-3)	26EECJ0 Measurements and Instrumentation TCP (PCC-3)	26EECK0 Battery Pack Design and BMS TCP (PCC-5)	26EECL0 DC Machines and Transformers Laboratory (PCC-1)		26CCEC0 Design Thinking (ESC-3)	26CCAC0 Constitution of India (AC-0)	28
IV	26EESC0 Discrete Mathematics (BSC -3)	26EGHB0 Professional Communication Laboratory (HSMC-2)	26CCLB0 Numerical Skills and Quantitative Problem Solving (EEC-1)	26CCED0 Environment and Sustainability (ESC-3)	26EEEC0 Object Oriented Programming TCP (ESC-3)	26EECM0 Linear Integrated Circuits (PCC-3)	26EECN0 AC Machines (PCC-3)	26EECP0 Control Systems (PCC-3)	26EECQ0 EV Charger Development and Testing TCP (PCC-5)	26EECR0 AC Machines Laboratory PCC-1)	26EECS0 Integrated Circuits Laboratory (PCC-1)		26CCAD0 Indian Knowledge System (AC-0)	28
V	26CCHA0 Project Management (HSMC-3)	26CCLC0 Aptitude Skills (EEC-2)	26EEED0 Data Structures TCP (ESC-3)	26EEFXX Basic Science Elective/ Language Elective (OEC-3)	26EECT0 Microcontrollers (PCC-3)	26EECU0 Generation, Transmission and Distribution (PCC-4)			26EECV0 Motor Design, Drive Developmer and Testing TCP (PCC-5)	26EECW0 26EE570 Microcontrollers Laboratory (PCC-1.5)	26EECX0 Power Electronics and Drives Laboratory (PCC-1.5)	26EELA0 Project-I (EEC-3)	26CCAE0 Universal Human Values and Ethics (AC-0)	29

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VI	**26CCHB0 Accounting and Finance (HSMC-3)**	**26EEGXX Interdisciplinary Elective (OEC-3)**	**26EECY0 Power System Analysis TCP (PCC-4)**	**26EEPXX PEC-1 (3)**	**26EEPXX PEC-2 (3)**				**26EECZ0 Vehicle Testbed TCP (PCC-5)**	**26EEDA0 Control Systems Laboratory (PCC-1)**		**26EELB0 Project-II (EEC-3)**	**26CCAF0 Disaster Management (AC-0)**	**25**
VII	**26EEPXX PEC-3 (3)**	**26EEPXX PEC-4 (3)**	**26EEPXX PEC-5 (3)**	**26EEPXX PEC-6 (3)**	**26EEPXX PEC-7 (3)**							**26EELC0 Project-III (EEC-3)**		**18**
VIII												**26EELD0 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 | EEC: 0 | Total: 43

CATEGORY-WISE CREDIT DISTRIBUTION:

SEM.	HSMC	BSC	ESC	PCC	PEC	OEC	EEC	CREDITS
I	3	8.5	5	4.5	-	-	-	21
II	-	7.5	6	8.5	-	-	-	22
III	-	3	6	18	-	-	1	28
IV	2	3	3	16	3	-	1	28
V	3	-	3	15	-	3	5	29
VI	3	-	-	13	3	3	3	25
VII	-	-	-	-	15	-	3	18
VIII	-	-	-	-	-	-	3	3
CATEGORYWISE CREDITS	11	22	23	75	21	6	16	TOTAL 174

THIAGARAJAR COLLEGE OF ENGINEERING,MADURAI –625 015

B.E. Degree Programme

Electrical and Electronics Engineering

COURSES OF STUDY

(For the candidates admitted from 2026-27 onwards)

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
26EECA0	Electric Circuit Analysis	PCC	2	1	-	3
AUDIT COURSE						
26TAAA0	Heritage of Tamils	AC				-
26CCAA0	Vision and Speed Maths	AC				-
THEORY CUM PRACTICAL						
26EGHA0	Technical English	HSMC	2	-	2	3
26MEEA0	Engineering Graphics	ESC	1	-	4	3
26CCEA0	Introduction to Engineering	ESC	1	-	2	2
PRACTICAL						
26CHSC0	Chemistry Laboratory	BSC	-	-	3	1.5
26EECB0	Electric Circuit Analysis Laboratory	PCC	-	-	3	1.5
Total			**12**	**2**	**14**	**21**

HSMC : Humanities and Social Science including Management courses
BSC : Basic Science Courses
ESC : Engineering Science Courses
PCC :Program Core Courses
PEC :Program Elective Courses
OEC :Open Elective Courses
EEC :Employability Enhancement Courses
AC :Audit Courses
L : Lecture , T : Tutorial ,P: Practical

Note :

1 Hour Lecture is equivalent to 1 credit
1 Hour Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

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THIAGARAJAR COLLEGE OF ENGINEERING,MADURAI –625 015

B.E. Degree Programme

Electrical and Electronics Engineering

SECOND SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26EESA0	Numerical Techniques and Transforms	BSC	2	1	-	3
26PHSA0	Physics	BSC	3	-	-	3
26EEEA0	Electromagnetic Field Theory	ESC	3	-	-	3
26EECC0	Digital Systems	PCC	4	-	-	4
26EECD0	Electronic Devices and Circuits	PCC	3	-	-	3
26CCEB0	Biology for Engineers	ESC	3	-	-	3
AUDIT COURSE						
26TAAB0	Tamils and Technology	AC				-
26CCAB0	Foundations of Problem Solving-1	AC				-
PRACTICAL						
26PHSB0	Physics Laboratory	BSC	-	-	3	1.5
26EECE0	Electronic Devices and Circuits Laboratory	PCC	-	-	3	1.5
Total			**18**	**1**	**6**	**22**

HSMC : Humanities and Social Science including Management courses
BSC : Basic Science Courses
ESC : Engineering Science Courses
PCC :Program Core Courses
PEC :Program Elective Courses
OEC :Open Elective Courses
EEC :Employability Enhancement Courses
AC :Audit Courses
L : Lecture , T : Tutorial ,P: Practical

Note :

1 Hour Lecture is equivalent to 1 credit
1 Hour Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI – 625 015

B.E. Degree Programme

Electrical and Electronics 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	26EECA0	Electric Circuit Analysis	3	40	60	100	27	50
THEORY CUM PRACTICAL								
4	26EGHA0	Technical English	3	50	50	100	25	50
5	26MEEA0	Engineering Graphics	3	50	50	100	25	50
6	26CCEA0	Introduction to Engineering	3	50	50	100	25	50
PRACTICAL								
7	26CHSC0	Chemistry Laboratory	3	60	40	100	18	50
8	26EECB0	Electric Circuit Analysis Laboratory	3	60	40	100	18	50

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	26EESA0	Numerical Techniques and Transforms	3	40	60	100	27	50
2	26PHSA0	Physics	3	40	60	100	27	50
3	26EEEA0	Electromagnetic Field Theory	3	40	60	100	27	50
4	26EECC0	Digital Systems	3	40	60	100	27	50
5	26EECD0	Electronic Devices and Circuits	3	40	60	100	27	50
6	26CCEB0	Biology for Engineers	3	40	60	100	27	50
THEORY CUM PRACTICAL - Nil								
PRACTICAL								
7	26PHSB0	Physics Laboratory	3	60	40	100	18	50
8	26EECE0	Electronic Devices and Circuits Laboratory	3	60	40	100	18	50

ELECTIVES

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.	26EEPA0	Power System Operation and Control	3	40	60	100	27	50
2.	26EEPB0	Electrical Machine Design	3	40	60	100	27	50
3.	26EEPC0	Switchgear and Protection	3	40	60	100	27	50
4.	26EEPD0	Wind and Solar Technology	3	40	60	100	27	50
5.	26EEPE0	Operation and Maintenance of Electrical Equipment	3	40	60	100	27	50

6.	26EEPF0	Energy Audit and Management in Electric Utilities	3	40	60	100	27	50
7.	26EEPG0	Power System Stability	3	40	60	100	27	50
8.	26EEPH0	VLSI Design	3	40	60	100	27	50
9.	26EEPJ0	Computer Organization	3	40	60	100	27	50
10.	26EEPK0	Control System Design	3	40	60	100	27	50
11.	26EEPL0	Industrial Instrumentation	3	40	60	100	27	50
12.	26EEPM0	Flexible AC Transmission Systems	3	40	60	100	27	50
13.	26EEPN0	Power Quality	3	40	60	100	27	50
14.	26EEPP0	Power Electronics for Renewable Energy Systems	3	40	60	100	27	50

15.	26EEPQ0	Electric Vehicles	3	40	60	100	27	50
16.	26EEPR0	Design of Electrical Installations	3	40	60	100	27	50
17.	26EEPS0	Smart Grid	3	40	60	100	27	50
18.	26EEPT0	Thermal Power Plant Instrumentation and Control	3	40	60	100	27	50
19.	26EEPU0	High Voltage Engineering	3	40	60	100	27	50
20.	26EEPV0	Biomedical Instrumentation	3	40	60	100	27	50
21.	26EEPW0	ASIC Design	3	40	60	100	27	50
22.	26EEPX0	Operation Research	3	40	60	100	27	50
23.	26EEPY0	HVDC Transmission	3	40	60	100	27	50
THEORY CUM PRACTICAL								
24.	26EEPZ0	Internet of Things	3	50	50	100	25	50

25.	26EEQA0	FPGA based System Design	3	50	50	100	25	50
26.	26EEQB0	Digital Signal Processing	3	50	50	100	25	50
27.	26EEQC0	Embedded Systems Design	3	50	50	100	25	50
28.	26EEQD0	Soft Computing	3	50	50	100	25	50
29.	26EEQE0	Real Time Operating System	3	50	50	100	25	50
30.	26EEQF0	Machine Learning	3	50	50	100	25	50
31.	26EEQG0	Simulation of Power Electronic Systems	3	50	50	100	25	50

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

1. Preamble

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

2. Prerequisite

- Nil

3. Course Outcome

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

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

4.Assessment Pattern

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

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

5.Syllabus

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

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

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

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

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

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

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

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

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

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

6. Learning Resources

6.1 Text Book

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

6.2 Reference Books & Web Resources

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

7. Course Contents and Lecture Schedule

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

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

8.Course Designer(s):

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

		Category	L	T	P	Credit
26CHSB0	**APPLIED CHEMISTRY**	**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	P hotovoltaics 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 prrchem@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

26EECA0	ELECTRIC CIRCUIT ANALYSIS	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 Outcomes

After 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	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	TPS 4	2.1.1	15%	NC	

	interconnect complex networks.					
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	

4.Assessment Pattern

CO	CAT1 *% of Marks*	Assignment 1 *% of Marks*	CAT2 *% of Marks*	Assignment 2 *% of Marks*	Terminal Exam *% 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

Circuit laws

Sources – Resistance – Inductance – Capacitance – Reactance – Impedance – Types of connections – Equivalent circuit – Phasors – Phasor diagram – Power Triangle

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

Transient Analysis

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

Two-port Networks

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

Three Phase Circuits & Coupled Circuits

Balanced and unbalanced star – delta connections – Power measurement – Two Wattmeter Method – 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
1.0	**Electric Circuits**	
1.1	Circuit laws, Sources, Resistance, Inductance, Capacitance, Reactance, Impedance	3
1.2	Types of connections, Equivalent circuit, Phasors, Phasor diagram, Power Triangle	3
2.0	**Steady State Analysis**	
2.1	Mesh and Nodal analysis	2
2.2	Thevenin's Theorem, Norton's Theorem, Superposition Theorem	2
2.3	Source transformation theorem, Maximum power transfer theorem, Frequency response of the circuit	2
2.4	Resonance	2
3.0	**Transient Analysis**	
3.1	Source free response for RL, RC & RLC circuits	2
3.2	Step response for RL, RC & RLC circuits	2
3.3	Sinusoidal response for RL, RC & RLC circuits	3
4.0	**Two-port Networks**	
4.1	Impedance and admittance parameters	3
4.2	Hybrid and Transmission parameters	2
4.3	Inter relation and interconnection of networks	2
4.4	Duality	2
5.0	**Three Phase Circuits**	
5.1	Balanced, unbalanced star – delta connections	2
5.2	Power measurement – Two wattmeter method	1
6.0	**Coupled Circuits**	
6.1	Mutual Inductance, Dot rule in coupled circuit	2
6.2	Energy in coupled circuits	1
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.

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

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

Preamble

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

Prerequisite

- Nil

Course Outcomes

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

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

Assessment Pattern

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

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

Assessment Pattern: Practical Component

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

Syllabus

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

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

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

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

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

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

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

Text Book

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

Reference Books & web resources

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

SDG Alignment

Activities aligned with SDGs addressed:

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

Course Contents and Lecture Schedule

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

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

List of Exercises with CO Mapping

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

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

Course Designer(s):

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

26EECB0	ELECTRIC CIRCUIT ANALYSIS LABORATORY	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

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

No.	Course Outcome	TCE Proficiency Scale	Performance Indicator	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	SDG 7	2

4.Assessment Pattern: Cognitive Domain

Type of Assessment	**Component**	**Marks**	**Remarks**
Continuous Assessment	Pre-lab, In-lab, Post-lab	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, ckbeee@tce.edu

2. Dr. R. Rajan Prakash, Associate Professor, EEE, r_rajanprakash@tce.edu.

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

Preamble

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

Prerequisite

NIL

Course Outcomes

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

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

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

Assessment Pattern: Cognitive Domain

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

List of Experiments with CO Mapping

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

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

Course Designer(s):

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

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

1. Preamble

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

2. Prerequisite

NIL

3. Course Outcome:

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

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

4. Assessment Pattern

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

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

5. Syllabus

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

Module 2:
Hero Stone to Modern Sculpture – Bronze Icons – Tribes and their Handicrafts – Art of Temple Car Making – Massive Terracotta Sculptures – Village Deities – Thiruvalluvar Statue at Kanyakumari – Making of Musical Instruments: Mridangam, Parai, Veenai, Yazh and Nadaswaram – Role of Temples in Social and Economic Life of Tamils.

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

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

Module 5:
Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the Other Parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous System of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

6. Learning Resources

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

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

1. Course Contents and Lecture Schedule

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

Course Designers:

Mr. M Babu.mbutce@tce.edu

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

1. Preamble

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

2. Course Outcomes

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

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

3. Assessment Pattern

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

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

4. Syllabus

Module 1: Vision — Orientation & Programme Overview

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

Module 2: Vision — Diagnostic Online Test

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

Module 3: Vision — Group Counseling & Career Mapping

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

Module 4: WOWs — Foundational Methods

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

Module 5: WOWs — Advanced Methods

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

5. Learning Resources

5.1 Text Book

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

5.2 Reference Books & Web Resources

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

6. Course Designer(s)

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

26EESA0	NUMERICAL TECHNIQUES AND TRANSFORMS	Category	L	T	P	Credit
		BSC	2	1	0	3

1.Preamble

Numerical Techniques and Transforms provide a strong foundation in advanced mathematical transforms and numerical techniques essential for solving complex engineering and scientific problems. Mastery of Laplace and Fourier Transforms enables effective analysis of signals and systems in the frequency domain, while numerical methods equip learners to solve algebraic, transcendental, and differential equations where analytical solutions are impractical

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	Use numerical methods to determine approximate solutions for algebraic and transcendental equations	TPS3	1.1.1	10%	SDG 4	2
CO2	Solve systems of linear equations using direct and iterative methods.	TPS3	1.1.1	20%	SDG 4	2
CO3	Apply the Fourier Transform and its properties to solve engineering problems	TPS3	1.1.1	20%	SDG 4	2
CO4	Apply the Laplace Transform and its properties to evaluate transforms of functions, including periodic functions, derivatives, and integrals.	TPS3	1.1.1	15%	SDG 4	2
CO5	Use inverse Laplace transforms and	TPS3	1.1.1	15%	SDG 4	2

	convolution techniques to solve differential equations and evaluate definite integrals.					
CO6	Apply numerical techniques to evaluate integrals and solve ordinary differential equations.	TPS3	1.1.1	20%	SDG 4	2

4.Assessment Pattern

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

5.Syllabus

Solution of Algebraic and Transcendental Equations:

Bisection method – Regula-falsi method – Newton-Raphson method. ‘

Solution of Linear Simultaneous Equations:

Direct Methods: Gauss elimination and Gauss-Jordan methods – Factorization method – Iterative methods: Jacobi’s iteration method – Gauss-Seidel iteration method.

Fourier Transform:

Fourier transform – Properties of Fourier transforms – Fourier Sine and Cosine transforms – Convolution – Parseval’s identity for Fourier transforms.

Laplace Transforms:

Laplace transform – Properties – Transforms of Periodic Functions – Transforms of Derivatives – Transforms of Integrals – Evaluations of integrals by Laplace Transform – Inverse Transforms – Convolution Theorem – Application to Differential Equations.’

Numerical Solution of Ordinary Differential Equations:

Euler’s Method – Modified Euler Method – Runge-Kutta Method.

Numerical Integration:

Trapezoidal Rule – Simpson’s one-third Rule – Simpson’s three-eighth Rule

6.Learning Resources

6.1 Text Book

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, 42nd Edition, New Delhi, 2012.
   Module 1: Unit-VII, Chapter 28, Sec 28.1-28.3
   Module 2: Unit-VII, Chapter 28, Sec 28.5-28.7
   Module 3: Unit-VI, Chapter 22, Sec 22.4-22.7
   Module 4: Unit-VI, Chapter 21, Sec 21.1-21.5, 21.7-21.15
   Module 5: Unit-VII, Chapter 32, Sec 32.4, 32.5, 32.7
   Module 6: Unit-VII, Chapter 30, Sec 30.6-30.8

6.2 Reference Books & Web resources

1. Erwin Kreszig, "Advanced Engineering Mathematics", Wiley, 10th edition, 2017.
2. Steven C. Chapra, Raymond P. Canale, “Numerical Methods for Engineers”, McGrawHill Higher Education,7th Edition, 2016.
3. Peter V.O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi, 2012.
4. Richard L Burden and Douglas J Faires, "Numerical Analysis", Thomas Learning, New York, 2017.
5. Ward Cheney and David Kincaid, "Numerical Mathematics and Computing", Cengage Learning, USA, 2018.

7.Course Contents and Lecture Schedule

Module No.	Topics	No. of Periods
1	**Solution of Algebraic and Transcendental Equations**	
1.1	Bisection method	1
1.2	Regula-falsi method	1
	Tutorial	1
1.3	Newton-Raphson method	1
2	**Solution of Linear Simultaneous Equations**	
2.1	Direct Methods: Gauss elimination method	1
	Tutorial	1
2.2	Direct Methods: Gauss-Jordan method	1
2.3	Direct Methods: Factorization method	1
	Tutorial	1
2.4	Iterative methods: Jacobi’s iteration method	1
2.5	Iterative methods: Gauss-Seidel iteration method	1
	Tutorial	1
3	**Fourier Transform**	
3.1	Fourier transform - Properties of Fourier transforms	2
	Tutorial	1
3.2	Fourier Sine and Cosine transforms	1
3.3	Convolution	1
3.4	Parseval’s identity for Fourier transforms	1
4	**Laplace Transforms**	
4.1	Laplace transform – Properties	2
	Tutorial	1
4.2	Transforms of Periodic Functions	1
4.3	Transforms of Derivatives and Integrals	1

	Tutorial	1
4.4	Evaluations of integrals by Laplace Transform	1
4.5	Inverse Transforms	1
	Tutorial	1
4.6	Convolution Theorem	1
4.7	Application to Differential Equations	1
	Tutorial	1
5	**Numerical Solution of Ordinary Differential Equations**	
5.1	Euler's Method – Modified Euler Method	1
5.2	Runge-Kutta Method	1
	Tutorial	1
6	**Numerical Integration**	
6.1	Trapezoidal Rule – Simpson's one-third Rule – Simpson's three-eighth Rule	2
	Tutorial	1
	Total	**36**

8.Course Designer(s):

1. Dr. L. Muthusubramanian Assistant Professor Mathematics lmsmat@tce.edu
2. Dr. I. Pradeepa Assistant Professor Mathematics ipamat@tce.edu
3. Dr. A. Muneesh Kumar Assistant Professor Mathematics amkmat@tce.edu.

26PHSA0	PHYSICS (COMMON TO ALL BRANCHES)

Category*	L	T	P	Credit
BSC	2	1	0	3

1. Preamble

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

2. Prerequisite

Physics and Mathematics at Higher Secondary Level (Class XII)

3. Course Outcomes

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

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

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

4. Assessment Pattern

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

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

5. Syllabus

Module 1: Mechanics of Solids (6 hrs)
Scalars and Vectors Under Rotation Transformation – Work-Energy Theorem – Central Forces – Energy in Conservative and Non-Conservative Forces – Conservation of Angular Momentum – Coordinate Systems: Cartesian, Polar, Cylindrical – Satellite Maneuvers.

Module 2: Oscillations and Waves (6 hrs)
Oscillatory Motion – Damped Oscillations – Forced Oscillations (Qualitative only): Differential Equation and its Solution – Q Factor – Impedance Matching – Group Velocity and Phase Velocity – Non-Dispersive Transverse and Longitudinal Waves in a String – Dispersive Waves – Seismic Waves – Water Waves and Tsunamis.

Module 3: Electrodynamics (6 hrs)
Maxwell's Equations of Electromagnetism – Equation of Continuity – Poynting's Theorem – Electromagnetic Waves – Polarization – EM Waves in Vacuum and Conductors – Energy and Momentum in EM Waves – Application: CT/MRI Scan.

Module 4: Physics of Electronic Materials (6 hrs)
Band Theory of Solids – Kronig-Penney Model (Qualitative only) – Bloch's Theorem – Intrinsic and Extrinsic Semiconductors – Carrier Concentration and Fermi Level – Electron and Hole Transport – Solar Cells – Charge Storage in Batteries and Supercapacitors – Materials for Electric Vehicles (EV) – 2D Materials, Flexible Electronic Materials, and Quantum Materials.

pModule 5: Quantum Mechanics (6 hrs)
Wave Nature of Particles – Wave Function – Expectation Values – Schrodinger Wave Equations – Uncertainty Principle – Particle in a 1D Box – Quantum Harmonic Oscillator – Quantum Tunnelling (Qualitative only) – Scanning Tunneling Microscope.

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

6. Learning Resources

6.1 Text Book

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

6.2 Reference Books & Web resources

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

7. Course Contents and Lecture Schedule

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

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

SDG-Aligned Academic Activities

CO	SDG	Activity	Linkage to Module	TPS	Level
CO1	SDG 9	Compute orbital velocity, period, and energy for a satellite executing a Hohmann transfer between circular orbits using conservation of angular momentum and the work-energy theorem.	Module 1 – Satellite Maneuvers	TPS 3	1
CO2	SDG 11	Use the forced-oscillation model to compute the resonant frequency and Q-factor for a seismic sensor and relate impedance matching to signal fidelity in earthquake early-warning systems.	Module 2 – Forced Oscillations, Seismic Waves	TPS 3	1

CO3	SDG 3	Apply Poynting's theorem to compute the power density of EM waves used in MRI and CT imaging and use polarization principles to explain contrast differentiation in medical scans.	Module 3 – Poynting's Theorem, CT/MRI Scan	TPS 3	1
CO4	SDG 7	Compute the efficiency of a p-n junction solar cell using given carrier concentration and Fermi level data and solve charge storage problems for a supercapacitor in an EV energy management scenario.	Module 4 – Solar Cells, EV Materials, Supercapacitors	TPS 3	2
CO5	SDG 4	Solve the particle-in-a-1D-box problem for a quantum dot of given dimensions, compute allowed energy levels and use the tunneling probability formula to explain STM tip-sample distance sensitivity.	Module 5 – Particle in 1D Box, Quantum Tunnelling, STM	TPS 3	0
CO6	SDG 9	Apply Hadamard and CNOT gate matrices to given qubit input states, trace the state on the Bloch sphere, and demonstrate the creation of entangled Bell states using quantum logic gate sequences.	Module 6 – Quantum Logic Gates, Entanglement	TPS 3	1

8.Course Designer(s):

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

26EEEA0	ELECTROMAGNETIC FIELD THEORY	Category	L	T	P	Credit
		ESC	3	0	0	3

1.Preamble

This course provides a strong foundation in electromagnetic field theory, covering electrostatic and magnetostatic fields, vector calculus, and material interactions. Students analyse resistance, capacitance, and inductance in practical systems such as transmission lines and cables. The course develops proficiency in applying Gauss's Law, Biot–Savart's Law, and Ampere's Law to engineering problems. It also explains force and torque on current-carrying conductors and their relevance to electrical machines. Time-varying fields are studied through Faraday's Law, Maxwell's equations, and Poynting's theorem, linking electromagnetic theory with modern electrical and power engineering applications.

2.Prerequisite

- NIL

3.Course Outcomes

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

No.	Course Outcome	TCE Proficiency Scale	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain the coordinate systems and vector calculus applicable to electric and magnetic fields	TPS 2	1.1.1	15%	NC	
CO2	Compare the behaviour of Electric and Magnetic fields in free space and in material space using basic laws.	TPS 2	1.2.1	20%	NC	
CO3	Relate Voltage, Current and basic circuit laws using Electric fields.	TPS 3	1.3.1	15%	NC	
CO4	Demonstrate Resistance, Inductance and Capacitance of materials with different resistivity, permeability, and permittivity using electric fields.	TPS 3	1.4.1	20%	NC	

CO5	Explain the force on a current carrying conductor and torque on a current loop subjected to magnetic fields.	TPS 2	1.3.1	15%	NC	
CO6	Relate dynamic electric and magnetic fields using Faraday's Law and Maxwell's Equations, and their applications to electrical machines.	TPS 3	1.4.1	15%	NC	

4. Assessment Pattern

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

5. Syllabus

Mathematical Foundation: Scalar, Vector, Vector addition, Subtraction and Multiplication, Coordinate Systems, Differential elements, Del operator, Gradient, Divergence and Curl of a vector, Divergence and Stoke's Theorem.

Electrostatic Fields: Coulomb's Law, Charge density, Electric field intensity, Electric flux density, Gauss law, Potential, Potential Difference, Basic circuit laws – verifications.
Material Characteristics – Current, Current Density, Conductivity/Resistance of materials. Continuity equation and time constant. Permittivity/Dielectric Strength of materials and application to capacitance & electrical insulation. Multiple Dielectrics and field behaviour at the interfaces. Calculation of capacitance for various applications and energy storage. Capacitance of Transmission lines and cables. Simulation of Electric Fields using FEM packages.

Magnetostatic Fields: Biot–Savart's Law and Ampere's Law, Magnetic flux density and Magnetic field intensity, Field behaviour at interface of magnetic materials, Inductance, application to Energy Storage and Magnetic Circuits. Inductance of Transmission lines and cables. Simulation of Magnetic Fields using FEM packages.

Force and Torque: Force on a current carrying conductor subjected to a magnetic field, Torque on a current loop subjected to a magnetic field and working principle of motor.

Dynamic Fields: Faraday's Law of Electromagnetic Induction, Principle of operation of generator and transformer, Displacement current, Maxwell's equations, Poynting Theorem.

6. Learning Resources

6.1 Text Book

1. William Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH Publishing Co. Ltd., 7th Edition, 2006.
2. Mathew N.O. Sadiku, "Principles of Electromagnetic Fields", 4th Edition, Oxford University Press, 2010.

6.2 Reference Books & Web resources

1. John D. Kraus, "Electromagnetics", McGraw-Hill International Editions, 4th Edition, 1992.
2. K.A. Gangadhar and P.M. Ramanathan, "Electromagnetic Field Theory (Including Antennas and Wave Propagation)", Khanna Publishers, 2012.
3. NPTEL E-Learning Courses: Basic Electrical Circuits – https://onlinecourses.nptel.ac.in/noc17_ee13
4. https://www.electrical4u.com/electromagnetic-field-theory.

7 Course Contents and Lecture Schedule

Module No.	Topics	No. of Periods
1.0	**Vector Calculus**	
1.1	Scalar, Vector, Vector addition, Subtraction and Multiplication	2
1.2	Coordinate Systems, Differential elements	2
1.3	Del operator, Gradient, Divergence and Curl of a vector, Divergence and Stoke's Theorem	3
2.0	**Electrostatic Fields**	
2.1	Coulomb's Law, Charge density, Electric field intensity	2
2.2	Electric flux density, Gauss law and its applications	2
2.3	Potential, Potential Difference, Basic circuit laws – verifications	2
2.4	Material Characteristics – Current, Current Density, Conductivity of materials	3
2.5	Permittivity, Dielectric Strength of materials and application to capacitance and insulation	3
2.6	Multiple Dielectrics and field behaviour at the interfaces	1
2.7	Calculation of capacitance for various applications and energy storage. Simulation of Electric Fields using FEM packages	3
2.8	Calculation of capacitance of transmission lines and cables	1

3.0	**Magnetostatic Fields**	
3.1	Biot–Savart's Law and Ampere's Law, Magnetic flux density and Magnetic field Intensity, Field behaviour at the interface of magnetic materials	2
3.2	Inductance, application to Energy Storage and Magnetic Circuits	2
3.3	Inductance of a Transmission line and Cable	1
3.4	Simulation of magnetic fields using FEM packages	1
4.0	**Force and Torque**	
4.1	Force on a Current carrying conductor subjected to magnetic field	1
4.2	Torque on a current carrying loop subjected to magnetic field; working principle of a motor	1
5.0	**Dynamic Fields**	
5.1	Faraday's Law, Principle of operation of generator and transformer	2
5.2	Displacement current and Maxwell's equations	1
5.3	Poynting Theorem	1
	Total	**36**

8. Course Designer(s):

1. Dr. R. Rajan Prakash, Associate Professor, EEE, r_rajanprakash@tce.edu
2. Dr. P.M. Devie, Assistant Professor, EEE, pmdeee@tce.edu

26EECC0	DIGITAL SYSTEMS	Category	L	T	P	Credit
		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

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

No.	Course Outcome	TCE Proficiency Scale	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain different number systems, codes, code converters and digital logic families	TPS2	1.3.1	20%	SDG 4	1
CO2	Design combinational circuits for the given applications using logic gates and standard combinational circuits (multiplexers and demultiplexers ,adders, subtractors, Encoders and Decoders)	TPS3	1.4.1	30%	SDG 9	1
CO3	Design synchronous sequential circuits for the given requirement including counters and sequence detectors	TPS3	1.4.1	20%	SDG 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%	SDG 4	1
CO6	Implement the given digital application using Programmable Logic Devices and illustrate the function of memories.	TPS3	2.1.1	10%	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	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 - C**odes:** 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 lCs, 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 ,C**odes:** 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)

1. Dr. D. Kavitha, Associate Professor, Dept. of EEE, dkavitha@tce.edu
2. Dr. B.Ashok Kumar, Associate Professor, Dept. of EEE, ashokudt@tce.edu.

26EECD0	ELECTRONIC DEVICES AND CIRCUITS	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 based 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	Explain the operation of Class A,B,C and D power amplifiers	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	

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	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**

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 mseee@tce.edu
2. Dr. V.Suresh Kumar, Professor, EEE vskeee@tce.edu
3.Dr.S.Arockia Edwin Xavier, Professor, EEE saexeee@tce.edu.

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

Preamble

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

Prerequisite

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

Course Outcomes

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

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

Assessment Pattern: Cognitive Domain

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

List of Experiments with CO Mapping

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

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

Course Designer(s):

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Dr. S. Karthickprabhu skphy@tce.edu

26EECE0	ELECTRONIC DEVICES AND CIRCUITS LABORATORY	Category	L	T	P	Credit
		PCC	0	0	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

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

No.	Course Outcome	TPS Level	Performance Indicator	Objective	SDG Addressed	SDG Level
CO1	Determine the equivalent circuit parameters of the given Diode, BJT, and MOSFET	TPS 3	5.2.1	1- Instrumentation	SDG 7	2
CO2	Design voltage regulator using Zener diode for the given specifications	TPS 3	4.3.1	4- Data Analysis	SDG 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- Data Analysis	SDG 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- Data Analysis	SDG 7	2
CO5	Analyze the performance of the amplifier and oscillator designed for the given specifications	TPS 4	7.1.2	4- Data Analysis	SDG 7	2

CO6	Analyze the performance of the analog device characteristics and analog circuits using simulation tools	TPS 4	7.2.1	4 Data Analysis	SDG 7	2

4. Assessment Pattern: Cognitive Domain

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

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,CO5
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 mseee@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 durig Sangam Age Strucural Contution House & Designs in Household materials	TPS2	PO1 – M PO2 – L	20	SDG 4	1
CO3	Metallurgical studies Art of Ship steel – Copper and gold- Coins as source of history Shell beads	TPS3	PO1 – S PO2 – M PO3 – L	20	SDG 4	1
CO4	Agricuture and Agro Procesing Ancient Knowledge of Ocean	TPS3	PO1 – S PO2 – M PO3 – L	20	SDG 4	1
CO5	Development of Scientific Tamil And Tamil computing	TPS3	PO1 – S PO2 – M PO3 – L	20	SDG 4	1

4. Assessment Pattern

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

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

5. Syllabus

Module 1:

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

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Module 2:

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

Module 3:

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

Module 4:

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

Module 5:

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

6. Learning Resources

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

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

2. Course Contents and Lecture Schedule

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

Course Designers:

Mr. M Babu.mbutce@tce.edu

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