B.E. COMPUTER SCIENCE AND ENGINEERING DEGREE PROGRAMME

SCHEDULING OF COURSES
&

CURRICULUM AND DETAILED SYLLABI

FOR

FIRST SEMESTER and SECOND SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2026 - 27 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

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

Department of Computer Science and Engineering

Vision

Excellence in Computer Science and Engineering education and research.

Mission

1. Strive for academic excellence in Computer Science and Engineering through a creative teaching learning process.

2. Transform students into technically competent, socially responsible and ethical Computer Science professionals.

3. Create Centres of Excellence in leading areas of Computer Science and Engineering.

4. Incubate, apply and spread innovative ideas by collaborating with relevant industries and R&D labs through focused research groups.

5. Attain these through continuous team work by a group of committed faculty, transforming the Computer Science and Engineering department as a leader in imparting Computer Science and Engineering education and research.

Program Educational Objectives (PEOs) for B.E. (CSE) Programme

PEO1: Graduates will have the ability to perform in technical/managerial roles ranging from design, development, problem solving to production support in software industries and R&D sectors.

PEO2: Graduates will have the ability to successfully pursue higher education in reputed institutions.

PEO3: Graduates will have the ability to adapt, contribute and innovate new technologies and systems in the key domains of Computer Science and Engineering.

PEO4: Graduates will be ethically and socially responsible solution providers and entrepreneurs in Computer Science and other engineering disciplines.

Program Outcomes (POs) for B.E. (CSE) Programme

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

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

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

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

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

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

Program Specific Outcomes (PSOs) for B.E.(CSE) Programme

PSO1: (Cognitive Outcome)

Ability to solve complex Knowledge Engineering problems by building systems across domains including Systems Engineering, Software Development & Engineering, Networks & Security, Data Mining and Artificial Intelligence.

PSO2: (Skill Outcome)

Ability to apply technical and research based skills learnt through professional society events, certification programs, projects and lab exercises to provide sustainable solutions to Computer Science and Engineering problems related to the society and environment.

PSO3: (Attitudinal and Behavioural Outcome)

Ability to practice as an ethical Software Engineer and/or Researcher in the evolving disciplines of Computer Science and Engineering and its allied application domains by employing soft and project management skills learnt through internships, project work and/or collaborative projects with industry.

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	

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

Sem	Theory / Theory cum Practical / Practical									CDIO Courses	Audit Courses (Mandatory Non- credit)	Credit
	1	2	3	4	5	6	7	8	9			
I	26MASA0 Applied Calculus for Engineers (BSC-4)	26PHSA0 Physics (BSC-3)	26EGHA0 Technical English (HSMC-3) (TCP)	**26CSCA0 Foundations of Programming Languages (PCC-3) (TCP)**			26CSEA0 Computer System Design (ESC-3)		26PHSB0 Physics Laboratory (BSC-1.5)	26CCEA0 Introduction to Engineering (ESC-2) TCP	26TAAA0 Heritage of Tamil 26CCAA0 Vision and Speed Maths (AC-0)	19.5
II	26CSSA0 Numerical Techniques and Linear Algebra (BSC-3)	26CHSB0 Applied Chemistry (BSC-3)	**26CSCB0 Digital System Design (PCC-3)**	**26CSCC0 Computer Architecture and Organization (PCC-4)**	**26CSCD0 Computer System Design Lab (PCC-1.5)**	**26CSCE0 Programming Lab (PCC- 1.5)**	26CSEB0 Problem Solving and Programming (ESC-3)	26CCEB0 Biology for Engineers (ESC-3)	26CHSC0 Chemistry Laboratory (BSC-1.5)		26TAAB0 Tamil and Technology 26CCAB0 Foundations of Problem Solving-1 (AC-0)	23.5
III	26CSSB0 Probability and Statistics (BSC-3)	**26CSCF0 Data Structures and Algorithms (PCC – 3)**	**26CSCG0 Object oriented Programming (PCC – 3)**	**26CSCH0 Operating Systems (PCC – 3) (TCP)**	**26CSCJ0 Graphics and Interactive Techniques (PCC – 3) (TCP)**	**26CSCK0 Data Structures Lab (PCC - 1.5)**	**26CSCL0 Object oriented Programming Lab (PCC - 1.5)**	26CSEC0 Programming Paradigms (ESC-3)	26CCLA0 Building Communication Skills (EEC-1)	26CCEC0 Design Thinking (ESC-3)	26CCAC0 Constitution of India (AC-0)	25
IV	26CSSC0 Discrete Mathematics (BSC-3)	**26CSCM0 Design and Analysis of Algorithms (PCC – 3)**	**26CSCN0 Data Communication and Networks (PCC – 3)** / **26CSCP0 Database Management Systems (PCC – 3)**	**26CSCQ0 Artificial Intelligence (PCC – 3)**	**26CSCR0 Web Programming (PCC – 4) (TCP)** / **26CSCS0 Algorithms Lab (PCC - 1.5)**	**26CSCT0 Artificial Intelligence Lab (PCC - 1.5)**	26CCED0 Environment and Sustainability (ESC-3)	26EGHB0 Professional Communication Lab (HSMC-2)	26CCLB0 Numerical Skills and Quantitative Problem Solving (EEC-1)		26CCAD0 Indian Knowledge System (AC-0)	28
V	26CCHA0 Project Management (HSMC-3)	**26CSCU0 Modelling and Optimization (PCC - 3)**	**26CSCV0 Theory of Computation (PCC - 3)** / **26CSCW0 Machine Learning (PCC - 3)**	**26CSCY0 Software Engineering (PCC - 3) (TCP)**	**26CSCZ0 Databases Lab (PCC - 1.5)**	**26CSDA0 Network Programming Lab (PCC - 1.5)**	26CSED0 Human Computer Interaction (ESC-3)	26CCLC0 Aptitude Skills (EEC-2)	Basic Science Elective / Language Elective (OEC-3)	26CSLA0 Project-I (EEC-3)	26CCAE0 Universal Human Values and Ethics (AC-0)	29
VI	26CCHB0 Accounting and Finance (HSMC-3)	**26CSDB0 Cryptography and Network Security (PCC - 3)**	**26CSDC0 Distributed Computing (PCC - 3)**	**26CSDD0 Compiler Design (PCC - 3)**	**26CSDE0 Deep Learning for Language and Vision (PCC - 3)**	**26CSDF0 Machine Learning Lab (PCC - 1)**	PEC-1 (3)	PEC-2 (3)	Interdisciplinary Elective (OEC-3)	26CSLB0 Project-II (EEC-3)	26CCAF0 Disaster Management (AC-0)	28
VII	PEC-3 (3)	PEC-4 (3)	PEC-5 (3)	PEC-6 (3)	PEC-7 (3)					26CSLC0 Project-III (EEC-3)		18
VIII										26CSLD0 Project-IV (EEC-3)		3
Total Credits												174

Passed in Board of Studies Meeting on 22.05.2026

Approved in 71st Academic Council Meeting on 27.06.2026

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI- 625 015
(A Govt. Aided, Autonomous Institution affiliated to Anna University)
Department of Computer Science and Engineering
Categorization of Courses

Humanities and Social Sciences including Management Courses (HSMC) (11 Credits)

- 26EGHA0 - Technical English (3) (TCP)
- 26EGHB0 - Professional Communication Lab (2)
- 26CCHA0 - Project Management (3)
- 26CCHB0 - Accounting and Finance (3)

Basic Science Courses(BSC) (22 Credits)

- 26MASA0 - Applied Calculus for Engineers (4)
- 26CSSA0 - Numerical Techniques and Linear Algebra (3)
- 26CSSB0 - Probability and Statistics (3)
- 26CSSC0 - Discrete Mathematics (3)
- 26PHSA0 - Physics (3)
- 26CHSB0 - Applied Chemistry (3)
- 26PHSB0 - Physics Laboratory (1.5)
- 26CHSC0 – Chemistry Laboratory (1.5)

Engineering Science Courses (ESC) (23 Credits)

- 26CSEA0 - Computer System Design (3)
- 26CCEA0 - Introduction to Engineering (2) (TCP)
- 26CSEB0 - Problem Solving and Programming (3)
- 26CCEB0 - Biology for Engineers (3)
- 26CSEC0 - Programming Paradigms (3)
- 26CCEC0 - Design Thinking (3)
- 26CCED0 - Environment and Sustainability (3)
- 26CSED0 - Human Computer Interaction (3)

Program Core Courses (PCC) (75 Credits)

- 26CSCA0 - Foundations of Programming Languages (3) (TCP)
- 26CSCB0 - Digital System Design (3)

- 26CSCC0 - Computer Architecture and Organization (4)
- 26CSCD0 - Computer System Design Lab (1.5)
- 26CSCE0 - Programming Lab (1.5)
- 26CSCF0 - Data Structures and Algorithms (3)
- 26CSCG0 - Object Oriented Programming (3)
- 26CSCH0 - Operating Systems (3) (TCP)
- 26CSCJ0 - Graphics and Interactive Techniques (3) (TCP)
- 26CSCK0 - Data Structures Lab (1.5)
- 26CSCL0 - Object Oriented Programming Lab (1.5)
- 26CSCM0 - Design and Analysis of Algorithms (3)
- 26CSCN0 - Data Communication and Networks (3)
- 26CSCP0 - Database Management Systems (3)
- 26CSCQ0 - Artificial Intelligence (3)
- 26CSCR0 - Web Programming (4) (TCP)
- 26CSCS0 - Algorithms Lab (1.5)
- 26CSCT0 - Artificial Intelligence Lab (1.5)
- 26CSCU0 - Modelling and Optimization (3)
- 26CSCV0 - Theory of Computation (3)
- 26CSCW0 - Machine Learning (3)
- 26CSCY0 - Software Engineering (3) (TCP)
- 26CSCZ0 - Databases Lab (1.5)
- 26CSDA0 - Network Programming Lab (1.5)
- 26CSDB0 - Cryptography and Network Security (3)
- 26CSDC0 - Distributed Computing (3)
- 26CSDD0 - Compiler Design (3)
- 26CSDE0 - Deep Learning for Language and Vision (3)
- 26CSDF0 - Machine Learning Lab (1)

Program Elective Courses (PEC) (21 Credits)

- Programme Elective – 1 (3)
- Programme Elective – 2 (3)
- Programme Elective – 3 (3)
- Programme Elective – 4 (3)
- Programme Elective – 5 (3)
- Programme Elective – 6 (3)
- Programme Elective – 7 (3)

Open Elective Courses (OEC) (6 Credits)

- Basic Science Elective / Language Elective (3)
- Interdisciplinary Elective (3)

Employability Enhancement Courses (EEC) (16 Credits)

- 26CCLA0 - Building Communication Skills (1)
- 26CCLB0 - Numerical Skills and Quantitative Problem Solving (1)
- 26CCLC0 - Aptitude Skills (2)
- 26CSLA0 - Project-I (3)
- 26CSLB0 - Project-II (3)
- 26CSLC0 - Project-III (3)
- 26CSLD0 - Project-IV (3)

Audit Courses (Mandatory Non-Credit)

- 26TAAA0 - Heritage of Tamil
- 26TAAB0 - Tamil and Technology
- 26CCAA0 - Vision and Speed Maths
- 26CCAB0 - Foundations of Problem Solving-1
- 26CCAC0 - Constitution of India
- 26CCAD0 - Indian Knowledge System
- 26CCAE0 - Universal Human Values and Ethics
- 26CCAF0 - Disaster Management

B.E. COMPUTER SCIENCE AND ENGINEERING DEGREE PROGRAMME

CURRICULUM AND DETAILED SYLLABI

FOR

FIRST SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2026-27 ONWARDS

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E. / B.Tech. Degree Programmes

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
26PHSA0	Physics	BSC	3	-	-	3
26CSEA0	Computer System Design	ESC	3	-	-	3
THEORY CUM PRACTICAL						
26EGHA0	Technical English	HSMC	2	-	2	3
26CSCA0	Foundations of Programming Languages	PCC	2	-	2	3
26CCEA0	Introduction to Engineering	ESC	1	-	2	2
PRACTICAL						
26PHSB0	Physics Laboratory	BSC	-	-	3	1.5
AUDIT COURSES						
26TAAA0	Heritage of Tamil	AC				-
26CCAA0	Vision and Speed Maths	AC	-	-	2	-
		Total				**19.5**

BSC : Basic Science Courses
HSMC : Humanities and Social Sciences including Management Courses
ESC : Engineering Science Courses
PCC : Programme Core Courses

L : Lecture
T : Tutorial
P : Practical

Note:
1 Lecture Period/week is equivalent to 1 credit
1 Tutorial Period/week is equivalent to 1 credit
1 Practical Period/week is equivalent to 0.5 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E. / B.Tech. Degree Programme

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	26PHSA0	Physics	3	40	60	100	27	50
3	26CSEA0	Computer System Design	3	40	60	100	27	50
THEORY CUM PRACTICAL								
4	26EGHA0	Technical English	3 (Terminal Exam Type : Theory)	50	50	100	22.5	50
5	26CSCA0	Foundations of Programming Languages	3 (Terminal Exam Type : Theory)	50	50	100	22.5	50
6	26CCEA0	Introduction to Engineering	3 (Terminal Exam Type : Practical)	50	50	100	22.5	50
PRACTICAL								
7	26PHSB0	Physics Laboratory	3	60	40	100	18	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 o f bounded regions.	TPS3	1.1.1	16%	SDG4	2
CO5	Apply double integrals to determine physical quantities such as density,mass, moments, center of mass, and moments of inertia and Surface Area.	TPS3	1.1.1	12%	SDG4	2
CO6	Compute volumes using triple integrals in Cartesian, Cylindrical, and Spherical coordinates.	TPS3	1.1.1	18%	SDG4	2

4. Assessment Pattern

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

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

5. Syllabus

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

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

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

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

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

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

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

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

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

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

6. Learning Resources

6.1 Text Book

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

6.2 Reference Books & Web Resources

1) George B. Thomas, "Thomas Calculus: Early Transcendentals", 14th Edition, Pearson Publishers, New Delhi, 2018.
2) Howard Anton, Irl Bivens and Stephen Davis, “Calculus: Early Transcendentals”,12thedition, John Wiley & Sons, 2021.
3) Kuldeep Singh, "Engineering Mathematics Through Applications", 2nd edition, Blooms berry publishing, 2019,
4) Kuldip S. Rattan, Nathan W. Klingbeil, Craig M. Baudendistel, “Introductory Mathematics for Engineering Applications”, 2nd edition, John Wiley& Sons, 2021.
5) Ron Larson and David C. Falvo, “Calculus: an Applied Approach”. 10th edition Cengage Learning 2015.

6) https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_ma79
7) https://ocw.mit.edu/courses/18-01-calculus-i-single-variable-calculus-fall-2020/
8) https://in.mathworks.com/matlabcentral/fileexchange/?q=calculus+applications

7. Course Contents and Lecture Schedule

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

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

8. Course Designer(s):

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

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

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.

Prerequisite

Physics and Mathematics at Higher Secondary Level (Class XII)

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

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.

Syllabus

Module 1: Mechanics of Solids (6 hrs)

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

Module 2: Oscillations and Waves (6 hrs)

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

Module 3: Electrodynamics (6 hrs)

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

Module 4: Physics of Electronic Materials (6 hrs)

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

Module 5: Quantum Mechanics (6 hrs)

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

Module 6: Quantum Computing (6 hrs)

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

6. Learning Resources

6.1 Text Book

- H. D. Young and R. A. Freedman, "University Physics with Modern Physics", Pearson Education, 15th Edition, 2023.
- D. J. Griffiths, "Introduction to Electrodynamics", Cambridge University Press, 4th Edition, 2017.
- 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.
- N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.
- R. P. Feynman, R. B. Leighton and M. Sands, "The Feynman Lectures on Physics – Vol. I, II & III", Addison-Wesley, 2011.
- NPTEL Course: "Engineering Physics" – https://nptel.ac.in
- 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

		Category	L	T	P	Credit
26CSEA0	**COMPUTER SYSTEM DESIGN**	ESC	3	0	0	3

Preamble

The Computer System Design focuses on the foundational concepts and design principles in the study of computer systems that typically spans across multiple core areas like computer hardware components, their architecture and organization, software systems etc. It bridges the conceptual gap between hardware and software, equipping students with both theoretical knowledge and practical skills essential for all subsequent core courses in computing.

Prerequisite

Nil

Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Apply the computer generations to illustrate the components of real-world computing scenarios	TPS3	1.3.1	10%		
CO2	Demonstrate the CPU organization and instruction processing steps to trace and predict execution flow of tasks	TP3	1.3.1	16%		
CO3	Apply the memory hierarchy model to select appropriate memory technologies for given system requirements	TP3	1.3.1	20%		
CO4	Demonstrate I/O data transfer techniques to solve data communication problems in a computer system design	TP3	1.3.1	20%	SDG9	1
CO5	Use the understanding of system workloads to match software types and hardware configurations for real-world application demands	TP3	1.3.1	20%	SDG9	1
CO6	Apply knowledge of modern computing platforms to propose suitable hardware solutions for edge, IoT, and AI-accelerated use cases	TP3	2.4.1	14%		

Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20	10	-	-	10
CO2	35	30	-	-	16

CO3	45	60	-	-	20
CO4	-	-	40	50	20
CO5	-	-	40	40	20
CO6	-	-	20	10	14
Total	100	100	100	100	100

Syllabus

Module 1: Functional Components of Computer Systems

Basics of Computers: Evolution of Computing Systems, Generations of Computers, Characteristics of Computers and Applications of Computers. Computer Organization: Functional Units of a Computer System - Central Processing Unit, Memory Unit, Input Unit and Output Unit.

Module 2: Hardware Component of Computer System: Processor Design

Logic Gates and Circuits, State and State Transition Concepts, Basics of CPU Organization - Arithmetic Logic Unit (ALU), Control Unit, Register Organization, Von Neumann Architecture, Instruction Processing, RISC and CISC Concepts, Modern Multicore Processors.

Module 3: Hardware Component of Computer System: Memory Systems Design

Evolution of Memory Technologies, Memory Hierarchy- Registers, Cache Memory, Main Memory, Secondary Storage, RAM and ROM Technologies, HDD and SSD Technologies, Optical Disks, Magnetic Tape drives, Virtual memory and Cloud Storage.

Module 4: Hardware Component of Computer System: Input/Output (I/O) System Design

I/O devices, I/O Organization, Peripheral Devices and Device Controllers, Ports, Interfaces, and Communication Buses, Data Transfer Techniques - Programmed I/O and Interrupt-Driven I/O, Direct Memory Access (DMA).

Interconnection of units, Processor to Memory communication, I/O devices to Processor communication, Interrupts and Bus Architecture.

Module 5: Software Interaction and System Workloads

Basics of Software, Types of software: System Software and Application Software, Case Study of System Software and Application Software, Introduction to System Workloads - CPU-Intensive Workloads, Data-Intensive Workloads and Network-Intensive Workloads, Relationship Between Workloads and Hardware Design.

Module 6: Modern Computing Platforms and Edge-Level Devices

Embedded Computing Systems, Edge Computing Concepts, Edge Devices, Smart Sensors, Wearable Devices, Smartphones, IoT Devices, Autonomous Systems, GPU and Accelerator-Based Computing, High-Performance Computing Systems, Modern Data Center Hardware Overview, Overview of Future Trends in Computer Hardware: AI Accelerators, Neuromorphic Computing and Quantum Computing.

Learning Resources

Text Books

1. V. Rajaraman and Neeharika Adabala, “Fundamentals of Computers”, Seventh Edition, PHI Learning Pvt. Ltd., 2025.
2. Ata Elahi, “Computer Systems: Digital Design, Fundamentals of Computer Architecture and ARM Assembly Language”, Second Edition, Springer, 2022.
3. William Stallings, "Computer Organization and Architecture Designing for Performance", Eleventh Edition, Pearson Education, 2022.
4. Yale N. Patt, Sanjay J. Patel, “Introduction to computing systems from bits & gates to C/C++ & beyond”, Third Edition, McGraw Hill, 2020.

Reference Books & Web resources

1. David A. Patterson & John L. Hennessy, "Computer Organization and Design: ARM Edition", Morgan Kaufmann, 2021.
2. Noam Nisan and Shimon Schocken, "The Elements of Computing Systems", MIT Press, 2021.
3. https://www.cse.iitb.ac.in/~mythili/decs/

4. https://www2.eecs.berkeley.edu/Courses/CS150/

Course Contents and Lecture Schedule

Module No.	Topics	No. of Periods	Course Outcomes
Module 1: Functional Components of Computer Systems			
1.1	Basics of Computers: Evolution of Computing Systems, Generations of Computers, Characteristics of Computers and Applications of Computers.	2	CO1
1.2	Computer Organization: Functional Units of a Computer System - Central Processing Unit, Memory Unit, Input Unit and Output Unit.	2	CO1
Module 2: Hardware Component of Computer System: Processor Design			
2.1	Logic Gates and Circuits	1	CO2
2.2	State and State Transition Concepts	2	CO2
2.3	Basics of CPU Organization - Arithmetic Logic Unit (ALU), Control Unit, Register Organization	2	CO2
2.4	Von Neumann Architecture, Instruction Processing	1	CO2
2.5	RISC and CISC Concepts	1	CO2
2.6	Modern Multicore Processors	1	CO2
Module 3: Hardware Component of Computer System: Memory Systems Design			
3.1	Evolution of Memory Technologies	1	CO3
3.2	Memory Hierarchy- Registers, Cache Memory, Main Memory, Secondary Storage	1	CO3
3.3	RAM and ROM Technologies	1	CO3
3.4	HDD and SSD Technologies	1	CO3
3.5	Optical Disks, Magnetic Tape drives	1	CO3
3.6	Virtual memory and Cloud Storage	1	CO3
Module 4: Hardware Component of Computer System: Input/Output (I/O) System Design			
4.1	I/O devices and I/O Organization	1	CO4
4.2	Peripheral Devices and Device Controllers, Ports, Interfaces, and Communication Buses	1	CO4
4.3	Data Transfer Techniques - Programmed I/O and Interrupt-Driven I/O	1	CO4
4.4	Direct Memory Access (DMA)	1	CO4
4.5	Interconnection of units, Processor to Memory communication, I/O devices to Processor communication	1	CO4
4.6	Interrupts and Bus Architecture	1	CO4
Module 5: Software Interaction and System Workloads			
5.1	Basics of Software, Types of software: System Software and Application Software	1	CO5
5.2	Case Study of System Software	1	CO5
5.3	Case Study of Application Software	1	CO5
5.4	Introduction to System Workloads and CPU-Intensive Workloads	1	CO5

5.5	Data-Intensive Workloads and Network-Intensive Workloads	1	CO5
5.6	Relationship Between Workloads and Hardware Design	1	CO5
Module 6: Modern Computing Platforms and Edge-Level Devices			
6.1	Embedded Computing Systems	1	CO6
6.2	Edge Computing Concepts, Edge Devices, Smart Sensors, Wearable Devices, Smartphones, IoT Devices	1	CO6
6.3	Autonomous Systems	1	CO6
6.4	GPU and Accelerator-Based Computing, High-Performance Computing Systems	1	CO6
6.5	Modern Data Center Hardware Overview	1	CO6
6.6	Overview of Future Trends in Computer Hardware: AI Accelerators, Neuromorphic Computing and Quantum Computing	1	CO6
	Total Periods	**36**	

Course Designer(s):

1. Dr.S.Prasanna, Associate Professor ,CSE sprcse@tce.edu
2. Dr.G.Madhupriya, Associate Professor ,CSE gmadhupriya@tce.edu

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

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.

Prerequisite

Nil

Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	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

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%		

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

Learning Resources

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.

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

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**

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**

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.

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

		Category	L	T	P	Credit	TE-Type
26CSCA0	**FOUNDATIONS OF PROGRAMMING LANGUAGES**	PCC	2	0	2	3	TCP-T

Preamble

This course introduces the fundamentals of programming using Python. It covers data types, operators, control structures, functions, collections, file processing, exception handling, and object-oriented programming. The course develops problem-solving and programming skills through the design and implementation of modular, readable, and reliable programs. It provides a foundation for advanced courses in data structures, algorithms, and software development.

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	Demonstrate the concepts of programming paradigms and Python fundamentals to configure the Python environment and develop syntactically correct Python programs.	TPS 3	1.3.1	10	NC	
CO2	Use Python expressions, decision-making statements, and iterative statements to develop solutions for well-defined computational problems.	TPS 3	1.3.1	18	NC	
CO3	Apply Python collections and array style processing techniques to manipulate and analyse structured data.	TPS 3	5.1.1	18	SDG 4	L2
CO4	Execute modular programs using functions, recursion, and basic functional constructs with appropriate testing and debugging practices.	TPS 3	2.4.1	18	SDG 9	L2
CO5	Implement reliable Python applications using file processing and exception handling techniques.	TPS 3	2.4.2	18	NC	

CO6	Analyse small object-oriented Python applications demonstrating encapsulation, inheritance, and polymorphism.	TPS 4	4.1.1	18	SDG 4, SDG 9	L3

Assessment Pattern

CO	CAT1	CAT2	Model Test CO-wise (Cognitive, Psychomotor, Affective)	OCR/Continuous Assessment (Pre-lab, In-lab, Post-lab)	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20	-	10	10	10
CO2	40	-	18	18	18
CO3	40	-	18	18	18
CO4	-	30	18	18	18
CO5	-	40	18	18	18
CO6	-	30	18	18	18
Total	100	100	100	100	100

Assessment Pattern: Practical Component

Type	Component	Marks	Type
Continuous Assessment(CA)	Pre-Lab + In-Lab + Post-Lab activities across all practical Sessions	75	Conducted throughout the Semester
Model Test	CO wise practical assessment	25	Summative Test-Mid Sem internal test
Total Internal	Model test (25) + CA (75)	100	-
End Semester Exam	Rubrics considering all CO's	100	Theory examination summative Exam

Syllabus

Module I - Introduction to Programming Languages

Role of Programming Languages – Need for Different Types of Programming Languages - Classification of Programming Paradigms - Introduction to Python – Features and applications of Python - Python Environment Setup - Alternate Python Implementations - Basic Syntax - Keywords - Identifiers - Indentation - Comments.

Module II - Fundamentals of Python Programming

Variables - Data Types - Type Casting - Operators - Expressions - Input Statements - Output Statements - Conditional Statements - Control Statements - Iterative Statements.

Module III - Data Structures in Python

Introduction to Collection Data Types - Lists - Numerical Lists - Tuples - Sets - Frozen Sets - Mapping Types - Dictionaries - Operations on Collections - Adding Elements - Updating Elements - Removing Elements - Slicing Elements - Array Processing Techniques - Counting Elements - Array Reversal - Partitioning Arrays - Removal of Duplicate Elements.

Module IV- Functions and Modules in Python

Functions - Parameter Passing Techniques - Types of Function Arguments - Variable Scope- Lambda Functions - Higher Order Functions - Map - Filter - Reduce - Recursion - Modules - Packing - Unpacking - Built in Functions.

Module V- File Processing and Exception Handling using Python

Introduction to File Processing and its operations - File Modes – Reading, Writing Text Files - Reading and writing Binary Data –File Pointer Operations – Exception Handling - Try Block - Except Block - Else Block - Finally Block - Raising Exceptions - User Defined Exceptions - Handling File Related Exceptions.

Module VI - Object Oriented Programming in Python

Introduction to Object Oriented Programming - Creating Classes, Objects - Constructors - Destructors – Instance, Class Variables – Instance, Class Methods - Static Methods - Encapsulation - Data Hiding - Abstraction - Single, Multiple, Multilevel Inheritance - Method Overriding - Polymorphism - Operator Overloading.

Learning Resources

Text Books

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist," 3rd Edition, O'Reilly, 2024.
2. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021

Reference Books & web resources

1. Eric Matthes, “Python Crash Course A Hands-On , Project - Based Introduction to Programming”, No Starch Press, Inc. 2nd Edition,2019
2. Mark Summerfield, “Programming in Python 3: A Complete Introduction to the Python Language”, Pearson Education, 2nd Edition, 2018
3. Mark Lutz, “Python Pocket Reference”, O Reilly, Fifth Edition, 2014
4. Swayam: https://onlinecourses.swayam2.ac.in/e-learning/preview/cec22_cs20

SDG Alignment

Activities aligned with SDGs addressed:

1. SDG 4 Quality Education: Students develop Python programs for basic learning support tasks such as quiz evaluation, simple grading utilities, and self-practice problem solvers to understand how computing can improve access to quality learning tools.
2. SDG 9 Industry Innovation and Infrastructure: Students design modular Python applications using collections, functions, files, exception handling, and object-oriented programming to solve real world data processing and automation problems related to digital infrastructure and software innovation

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Course Contents and Lecture Schedule

Module No	Topics	No of Periods	Course Outcomes
1	**Introduction to Programming Languages**		
1.1	Role of Programming Languages – Need for Different Types of Programming Languages - Classification of Programming Paradigms	1	CO1
1.2	Introduction to Python – Features and applications of Python – Python Environment Setup	1	CO1
1.3	Alternate Python Implementations – Basic Syntax- Keywords – Identifiers – Indentation – Comments	1	CO1
2	**Fundamentals of Python Programming**		
2.1	Variables – Data Types – Type Casting	1	CO2
2.2	Operators – Expressions- Input Statements – Output Statements	1	CO2
2.3	Conditional Statements	1	CO2
2.4	Control Statements – Iterative Statements	1	CO2
3	**Data Structures in Python**		
3.1	Introduction to Collection Data Types – Lists – Numerical Lists	1	CO3

3.2	Tuples – Sets – Frozen Sets- Mapping Types – Dictionaries	1	CO3
3.3	Operations on Collections – Adding Elements – Updating Elements – Removing Elements	1	CO3
3.4	Slicing Elements – Array Processing Techniques	1	CO3
3.5	Counting Elements – Array Reversal – Partitioning Arrays – Removal of Duplicate Elements	1	CO3
4	**Functions and Modules in Python**		
4.1	Functions – Parameter Passing Techniques – Types of Function Arguments	1	CO4
4.2	Variable Scope – Lambda Functions – Higher Order Functions- Map – Filter – Reduce	1	CO4
4.3	Recursion – Modules	1	CO4
4.4	Packing – Unpacking – Built in Functions	1	CO4
5	**File Processing and Exception Handling using Python**		
5.1	Introduction to File Processing and its operations - File Modes – Reading, Writing Text Files	1	CO5
5.2	Reading and writing Binary Data –File Pointer Operations	1	CO5
5.3	Exception Handling – Try, Except, Else and Finally Block	1	CO5
5.4	Raising Exceptions – User Defined Exceptions – Handling File Related Exceptions	1	CO5
6	**Object Oriented Programming in Python**		
6.1	Introduction to Object Oriented Programming – Creating Classes, Objects	1	CO6
6.2	Constructors – Destructors – Instance, Class Variables – Instance, Class Methods – Static Methods	1	CO6
6.3	Encapsulation – Data Hiding – Abstraction	1	CO6
6.4	Single, Multiple, Multilevel Inheritance – Method Overriding- Polymorphism – Operator Overloading	1	CO6
	Total Hours	**24**	

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Python basics and I O	1	Experimentation	CO1, CO2
2	Decision making and loops	1	Experimentation	CO2
3	String processing	1	Data Analysis	CO2, CO3
4	Collections	2	Data Analysis	CO3
5	Array processing tasks	2	Data Analysis	CO3
6	Functions and modules	2	Creativity	CO4
7	Recursion and functional tools	2	Creativity	CO4
8	File handling	2	Data Analysis	CO5
9	Exception handling	2	Learn from Failure	CO5
10	Classes and objects	3	Models	CO6

11	Inheritance and polymorphism	3	Models	CO6
12	Integrated mini project	3	Teamwork, Communication, Ethics, Integrity	CO1 to CO6

Course Designer(s):

1. Dr.M.Nirmala Devi , Assistant Professor (Sel.Gr), CSE mnit@tce.edu
2. Mrs.G.Bhavani , Assistant Professor CSE gbicse@tce.edu

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

1. Preamble

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

2. Prerequisite

Nil

3. Course Outcomes

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

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

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

4. Assessment Pattern

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

5. Assessment Pattern: Practical Component

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

6. Syllabus

Module 1: Engineering Around Us

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

Module 2: Engineering Measurements and Tools

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

Module 3: Engineering Visualization and Simulation

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

Module 4: Engineering Making

Introduction to engineering materials – Basic fabrication techniques: cutting, joining, and assembling – Workshop safety practices – Introduction to sensors and automation concepts – Team-based engineering activity – Building a simple functional model. **Module 5: Teamwork, Ethics and Sustainability**

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

7. Learning Resources

7.1 Text Books

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

7.2 Reference Books & Web Resources

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

8. Course Contents and Lecture Schedule

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

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

9. List of Experiments with CO Mapping

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

10. Course Designer(s):

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

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

Course Designer(s):

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

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 Weigh tage	SDG addres sed	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.

Approved in 71st Academic Council Meeting on 27.06.2026

5. Syllabus

Module 1:

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

Module 2:

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

Module 3:

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

Module 4:

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

Module 5:

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

6. Learning Resources

- தமிழக வரலாறு – மக்களும் பண்பாடும் (வவளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
- கணித் தமிழ் – முனைவர் இல சுந்தரம் (விகடன் பிரசுரம்)
- கீழடி – னவனக நதிக்கனரயில் சங்ககால நாகரீகம் (வதால்லியல் துனை வவளியீடு)
- வபாருனந ஆற்ைங்கனர நாகரீகம் (வதால்லியல் துனை வவளியீடு)
- Social Life of the Tamil – The Classical Period (Dr.K.K.Pillay) A joint publication of TNTB&ESC and RMRL – (inprint)
- Social Life of the Tamils- The Classical Period (Dr.S.Singaravelu) Published by: International Institute of 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)

Approved in 71st Academic Council Meeting on 27.06.2026

- 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

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 Influence of Tamils over the other parts of India – Self – Respect Movement	1
5.3	Role of Siddha Medicine in Indigenous System of Medicine – Inscription & Manuscripts – Print History of Tamil Books	1
	Total	15

Course Designers:

Mr. M Babu.mbutce@tce.edu

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

1. Preamble

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

2. Course Outcomes

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

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

3. Assessment Pattern

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

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

4. Syllabus

Module 1: Vision — Orientation & Programme Overview

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

Module 2: Vision — Diagnostic Online Test

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

Module 3: Vision — Group Counseling & Career Mapping

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

Module 4: WOWs — Foundational Methods

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

Module 5: WOWs — Advanced Methods

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

5. Learning Resources

5.1 Text Book

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

5.2 Reference Books & Web Resources

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

6. Course Designer(s)

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

B.E. COMPUTER SCIENCE AND ENGINEERING DEGREE PROGRAMME

CURRICULUM AND DETAILED SYLLABI

FOR

SECOND SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2026-27 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

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THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E. / B.Tech. Degree Programmes

COURSES OF STUDY
(For the candidates admitted from 2026-27 onwards)

SECOND SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
26CSSA0	Numerical Techniques and Linear Algebra	BSC	2	1	-	3
26CHSB0	Applied Chemistry	BSC	3	-	-	3
26CSCB0	Digital System Design	PCC	3	-	-	3
26CSCC0	Computer Architecture and Organization	PCC	4	-	-	4
26CSEB0	Problem Solving and Programming	ESC	3	-	-	3
26CCEB0	Biology for Engineers	ESC				3
PRACTICAL						
26CSCD0	Computer System Design Lab	PCC	-	-	3	1.5
26CSCE0	Programming Lab	PCC	-	-	3	1.5
26CHSC0	Chemistry Laboratory	BSC	-	-	3	1.5
AUDIT COURSES						
26TAAB0	Tamil and Technology	AC				-
26CCAB0	Foundations of Problem Solving-1	AC				-
		Total				**23.5**

BSC : Basic Science Courses
HSMC : Humanities and Social Sciences including Management Courses
ESC : Engineering Science Courses
PCC : Programme Core Courses

L : Lecture
T : Tutorial
P : Practical

Note:
1 Lecture Period/week is equivalent to 1 credit
1 Tutorial Period/week is equivalent to 1 credit
1 Practical Period/week is equivalent to 0.5 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E. / B.Tech. Degree Programme

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	26CSSA0	Numerical Techniques and Linear Algebra	3	40	60	100	27	50
2	26CHSB0	Applied Chemistry	3	40	60	100	27	50
3	26CSCB0	Digital System Design	3	40	60	100	27	50
4	26CSCC0	Computer Architecture and Organization	3	40	60	100	27	50
5	26CSEB0	Problem Solving and Programming	3	40	60	100	27	50
6	26CCEB0	Biology for Engineers	3	40	60	100	27	50
PRACTICAL								
7	26CSCD0	Computer System Design Lab	3	60	40	100	18	50
8	26CSCE0	Programming Lab	3	60	40	100	18	50
9	26CHSC0	Chemistry Laboratory	3	60	40	100	18	50

26CSSA0	NUMERICAL TECHNIQUES AND LINEAR ALGEBRA	Category	L	T	P	Credit
		BSC	2	1	0	3

Preamble

Numerical Techniques and Linear Algebra delivers a comprehensive integration of numerical techniques and advanced linear algebra essential for modern engineering and data-driven computational systems. This course develops quantitative reasoning, algorithmic thinking, and structured problem-solving skills that are critical for modern computing disciplines. It bridges mathematical theory with computational practice, preparing students to model, analyse, and solve problems encountered in data science, artificial intelligence, machine learning.

Prerequisite

Nil

Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Apply numerical techniques to solve equations and systems of equations	TPS3	1.1.1.	15%	SDG 4	2
CO2	Compute basis, dimension of vector spaces.	TPS3	1.1.1.	17%	SDG 4	2
CO3	Compute matrix representations of linear transformations and apply change-of-basis operations to characterize similar matrices representing the same operator.	TPS3	1.1.1.	17%	SDG 4	2
CO4	Apply the Gram-Schmidt orthogonalization process to construct an orthonormal basis from a given basis in an inner product space	TPS3	1.1.1.	17%	SDG 4	2
CO5	Compute eigenvalues and eigenvectors to perform matrix diagonalization.	TPS3	1.1.1.	17%	SDG 4	2
CO6	Apply matrix factorization techniques to compute the singular value decomposition and execute principal component analysis	TPS3	1.1.1.	17%	SDG 4	2

Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	30	30			15
CO2	35	35			17
CO3	35	35			17

CO4			34	34	17
CO5			33	33	17
CO6			33	33	17
Total	**100**	**100**	**100**	**100**	**100**

Syllabus

Numerical Techniques:
Solving Algebraic and Transcendental Equations: Newton-Raphson Method- The Secant Method. System of Linear Equations: Gauss Elimination and Gauss Jordan Method. System of Non-Linear Equations: Fixed point iteration - Newton Raphson Method.

Vector Spaces:
Introduction to Vector spaces and Subspaces -Linear Independence - Basis and Dimension- Null Space, Row space and Column space – Rank-Nullity Theorem.

Linear Transformations:
Linear Transformations - Definitions and Examples - Matrix Representations of Linear Transformations – Similarity of transformation

Orthogonality:
Inner Product spaces - Orthonormal sets - The Gram-Schmidt Orthogonalization Process- QR Decomposition.

Eigen Systems and Its Applications:
Eigenvalues and Eigenvectors of Matrices – Properties of Eigenvalues and Eigenvectors - Diagonalization of Matrices.

Singular Value Decomposition and Principal Component Analysis:
The Singular Value Decomposition of Matrices - Generalized inverse - Principal Component Analysis.

Learning Resources

6.1Text Book

1. Steven J. Leon and Lisette G.de Pillis “Linear Algebra with Application” Pearson Education, Tenth Edition, 2021.
   Vector Spaces: 3.3,3.4,3.6
   Linear Transformations: 4.1,4.2,4.3
   Orthogonality: 5.4,5.5,5.6
   Eigen Systems and its Applications: 6.1,6.3,
   Singular Value Decomposition and Generalized inverse: 6.5, 7.7
2. Steven C. Chapra and Raymond P. Canale, “Numerical Methods for Engineers” McGraw Hill Publications, 8th Edition, 2021.
   Numerical Techniques: 6.2,6.3, 9.2, 6.6
3. David C. Lay. Steven R. Lay. J.J. McDonald, “Linear Algebra and Its Applications” Pearson Education Limited, 5th Edition, 2022.
   Principal Component Analysis: 7.5

Reference Books & Web resources

1. Gilbert Strang., “Introduction to Linear Algebra”, Wellesley-Cambridge Press, 6th Edition, 2023.
2. Grewal B.S., “Numerical Methods in Engineering and Science”, Mercury Learning and Information, 1st Edition, 2019.
3. https://nptel.ac.in/courses/111106051
4. https://www.coursera.org/learn/linear-algebra-machine-learning

Course Contents and Lecture Schedule

Module No.	Topics	No of Periods
1	**Numerical Techniques**	
1.1	Solving Algebraic and Transcendental Equations: Newton-Raphson and The Secant Method	1
1.2	Linear System of Equations: Gauss Elimination, Gauss Jordan.	1
	Tutorial	1
1.3	System of Non-Linear Equations: Fixed point iteration	1
1.4	Newton Raphson Method	1
	Tutorial	1
2	**Vector Spaces**	
2.1	Introduction to vector spaces and subspaces	1
2.2	Linear Independence	1
	Tutorial	1
2.3	Basis and Dimension	1
2.4	Null Space and Row Spaces	1
	Tutorial	1
2.5	Column space & Rank-Nullity Theorem	1
3	**Linear Transformations**	
3.1	Linear Transformations- Definitions and Examples	1
	Tutorial	1
3.2	Matrix Representations of Linear Transformations	2
	Tutorial	1
3.3	Similarity of Transformations	1
4	**Orthogonality**	
4.1	Inner Product spaces Definition and Examples	1
	Tutorial	1
4.2	Orthonormal sets	1
4.3	The Gram-Schmidt process and QR-Decomposition	1
	Tutorial	1
5	**Eigen Systems and Its Applications**	
5.1	Eigenvalues and Eigenvectors of Matrices	1
5.2	Properties of Eigenvalues	1
	Tutorial	1
5.3	Diagonalization of Matrices	2
	Tutorial	1
6	**Singular Value Decomposition and Principal Component Analysis**	
6.1	The Singular Value Decomposition of Matrices	2
	Tutorial	1
6.2	Generalized inverse	1
6.3	Principal Component Analysis	1
	Tutorial	1
	Total Hours	36

Course Designer(s):

1. Dr. C. S. Senthilkumar, Assistant Professor, Mathematics kumarstays@tce.edu
2. Dr. P. Victor, Assistant Professor, Mathematics pvmat@tce.edu
3. Dr. I. Pradeepa, Assistant Professor, Mathematics ipamat@tce.edu

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

1. Preamble

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

2. Prerequisite

- Nil

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain water quality parameters and assessment techniques, including IOT based sensors, to assess water suitability for domestic, industrial, and boiler applications.	2	1.2.1	10	SDG 3 – Good Health and well-being SDG 6 - Clean water and sanitation	2
CO2	Apply standard estimation techniques, appropriate water treatment methods to select and justify solutions for boiler feed water preparation and industrial effluent treatment.	3	1.2.1	20	SDG 6 - Clean water and sanitation	2
CO3	Apply the principles and instrumentation of spectroscopic techniques to identify materials and interpret spectra for chemical, environmental, biomedical, and space applications.	3	1.2.1	20	SDG 3 – Good Health and well-being	2
CO4	Apply electrochemical principles to analyze energy storage systems and photovoltaic devices	3	1.2.1	16	SDG 7 – Affordable and Clean Energy	2
CO5	Use the concepts of corrosion mechanisms and surface protection techniques to select appropriate corrosion control measures for electronic devices.	3	1.2.1	14	SDG 9 – Industry, Innovation and Infrastructure	2
CO6	Apply structure–property relationships	3	1.2.1	20	SDG 9 - Industry, Innovation and	2

	of ceramics, carbon-based nanomaterials to select suitable materials for specific applications.				Infrastructure SDG 12 – Responsible consumption	

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

4.5	Molecular electronics - Conducting polymers and organic semiconductors, Organic light-emitting devices (OLEDs), Applications in wearable and flexible electronics	1
	Total Periods	36

8. Course Designer(s):

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

26CSCB0 DIGITAL SYSTEM DESIGN

Category	L	T	P	Credit
PCC	3	0	0	3

1. Preamble

Digital system design course is designed to make students familiar with the design of combinational and sequential circuits by considering the system requirements and constraints. Students will gain practical exposure to Verilog HDL for modelling and simulation of digital circuits. This course also addresses the control and data path design principles.

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 number systems, data encoding standards and binary arithmetic	TPS2	1.3.1	10	-	
CO2	Execute the simplification of Boolean logic functions by applying the theorems and postulates of Boolean algebra and Karnaugh map.	TPS3	1.3.1	15	SDG 4	2
CO3	Implement combinational logic circuits by using gates, multiplexers and Programmable logic devices	TPS3	2.4.1	25	SDG 9	2
CO4	Develop VHDL program for combinational circuits	TPS3	2.4.1	15	SDG 9	2
CO5	Implement the sequential logic circuits like counters and shift registers by using the given Flip flops.	TPS3	2.4.1	20	SDG 9	2
CO6	Implement Sequence detectors and RTL based control and data path design	TPS3	1.3.1	15	SDG 9	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	30	40			15
CO3	50	60			25
CO4			30	30	15

CO5			40	40	20
CO6			30	30	15
Total	100	100	100	100	100

5. Syllabus

Module 1: Binary Number System, Data Encoding and Boolean Algebra:
Binary Number system and its conversion to hexadecimal number System-Complements, Signed Binary Numbers and Arithmetic-Binary Coded Decimal (BCD) and decimal Addition using BCD– Precision and overflow concepts – Floating-point representation: IEEE 754 single and double precision format –Character encoding standards: ASCII and Unicode (UTF-8, UTF-16).

Module 2: Boolean theorems and Gate level minimization:
Theorems and Properties of Boolean Algebra- Canonical and standard forms –Digital Logic Gates and Logic Operations-Simplification of logic functions using Karnaugh Map(K-map) Method- Four 12variable K-map-Don't cares-: Two-level implementation: AND-OR, OR-AND, NAND-NAND, NOR-NOR implementation

Module 3: Combinational Logic Design:
Design and Implementation Binary Adder, Subtractor and Multiplier – Magnitude comparator, decoder and encoder-Multiplexers – Demultiplexer and their applications in implementing combinational logic functions –Organization of ROM, PLA and PAL and their application in implementing combinational logic circuits–Introduction to Complex PLDs (CPLDs) and Field Programmable Gated Array(FPGA)- Integrated circuits (IC) and its types

Module 4: Hardware Description Language – Verilog for Combinational Circuits:
Introduction to Hardware Description Language –Modelling Combinational Circuits: Dataflow modelling using assign statements and continuous assignments – Gate-level modelling – Behavioural modelling of simple combinational circuits – User-defined primitives (UDPs) – Test Benches

Module 5: Sequential Logic Design:
Introduction- SR latch and D latch operation – Positive and negative edge-triggered D, JK, and T flip-flops – truth table- logic diagrams and conversions between them-Sequential Building Blocks: Registers: SISO, SIPO, PISO, PIPO shift registers – Universal shift register – Design of 4-bit, 8-bit registers – Synchronous counters: up-counter, down-counter, up-down counter – Ripple (asynchronous) counters: 4-bit ripple counter – Modulo-N counters – Johnson counter and ring counter

Module 6: Finite State Machines and Control-Datapath Design:
Finite state machines(FSM) – Principles and operation of Mealy and Moore type Circuits-Design of Mealy and Moore type simple sequence detectors-Introduction-Register Transfer Level (RTL) Notation-Algorithmic State Machine (ASM)- ASM Chart –ASM Block –simplifications- Timing consideration –ASMD Chart –Design examples- Sequential binary multiplier- Design for Low power Edge devices- Processors –CPU, GPU,FPGA and ASIC Comparison

6. Learning Resources

6.1 Text Book

1. M. Morris Mano, Micheal D. Ciletti, Digital Design: With an Introduction to the Verilog HDL,VHDL, and System Verilog, Pearson Education; Sixth edition,2018.

6.2 Reference Books & Web resources

1. R. P. Jain and KishorSarawadekar, "Modern Digital Electronics", McGraw-Hill, Standard Edition, 2022.
2. Stephen Brown and ZvonkoVranesic, "Fundaentals of Digital Logic with Verilog Design", McGraw-Hill, 3rd Edition, 2014.
3. Leach, Malvino, Saha, Digital Principles and Applications, McGraw Hill Education; Eighth edition, 2014.
4. Mohammed Ferdjallah, Introduction to digital systems, Modelling, Synthesis and simulation using VHDL, Wiley,2011.
5. Alan B. Marcovitz,Introduction to Logic Design, 3rd Edition. McGraw-Hill, 2010.
6. NPTEL Course: Digital Circuits – https://nptel.ac.in/courses/108105132

7. https://stlpartners.com/articles/edge-computing/edge-computing-devices/
8. S. R. Jena, Dr. Dileep Kumar M , Dr. UppalapatiSrilakshmi, Dr. MukeshSoni“ Integrated Chip Design Using Artificial Intelligence “,NGUI USA,2025

7. Course Contents and Lecture Schedule

Module No.	Topics	No. of Periods
1	**Module 1: Number Systems, Data Encoding, and Boolean Algebra**	
1.1	Binary Number system and its conversion tohexadecimal number System-Complements, Signed Binary Numbers and Arithmetic-	2
1.2	BinaryCoded Decimal (BCD) and decimal Addition using BCD	
1.3	Precision and overflow concepts – Floating-point representation– Character encoding standards: ASCII and Unicode	2
2	**Module 2:Boolean theorems and Gate level minimization**	
2.1	Theorems and Properties of BooleanAlgebra- Canonical and standard forms	2
2.2	Digital Logic Gates and Logic Operations	1
2.3	Simplification of logic functions using Karnaugh Map (K-map) Method- Four variable K-map-Don’t cares	2
2.4	Two-level implementation: AND-OR, OR-AND, NAND-NAND, NOR-NOR implementation	1
3	**Module 3:Combinational Logic Circuits**	
3.1	Design and Implementation Binary Adder, Subtractor and Multiplier	2
3.2	Magnitude comparator, decoder and encoder	2
3.3	Multiplexers and their applications in implementing combinational logic functions -	1
3.4	Organizationof ROM, PLA and PALand their application in implementing combinational logic circuits	2
3.5	Introduction to Complex PLDs (CPLDs) and Field Programmable Gated Array (FPGA)	1
4	**Module 4: Hardware Description Language – Verilog for Combinational Circuits**	
4.1	Introduction to Hardware Description Language – Modeling Combinational Circuits: Dataflow modeling using assign statements and continuous assignments	1
4.2	Gate-level modeling – Behavioral modeling	2
4.3	modeling of simple combinational circuits – User-defined primitives (UDPs) – Test Benches	2
5	**Module 5: Sequential Logic Design**	
5.1	Introduction- SR latch and D latch operation –Positive and negative edge-triggered D, JK, and T flip-flops – truth table- logic diagrams and conversions between them	2
5.2	Sequential Building Blocks: Registers: SISO, SIPO, PISO, PIPO shift registers – Universal shift register	2
5.3	Synchronous counters: up-counter, down-counter, up-down counter	2
5.4	– Ripple (asynchronous) counters: 4-bit ripple counter – Modulo-N counters – Johnson counter and ring counter	1
6	**Module 6: Finite State Machines and Control-Datapath Design**	
6.1	Finite state machines (FSM) – Principles and operation of Mealy and Moore type Circuits	2
6.2	Design of Mealy andMoore type simple sequencedetectors	
6.3	Introduction-Register Transfer Level (RTL) Notation-	

6.4	Algorithmic State Machine (ASM)- ASM Chart –ASM Block – simplifications- Timing consideration –ASMD Chart	2
6.5	Design example- Sequential binary multiplier	2
	TOTAL PERIODS	36

8.Course Designer(s):

1. Dr.C.Senthilkumar, Associate Professor, CSE cskcse@tce.edu
2. Mrs.J.Vijayalakshmi, Assistant Professor, CSE jvicse@tce.edu
3. Dr.S.Padmavathi, Professor, AI spmcse@tce.edu

26CSCC0	COMPUTER ARCHITECTURE AND ORGANIZATION	Category	L	T	P	Credit
		PCC	4	0	0	4

1. Preamble

This course introduces the principles of computer architecture and organization from the hardware-software interface to modern parallel systems. It enables students to understand instruction execution, apply performance and arithmetic concepts, model processor datapath/control, apply memory and I/O organization, and analyse GPU architectures and their performance trade-offs.

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	Apply instruction-set architecture concepts to interpret instruction formats, addressing modes, assembly-level instructions, and the fetch-decode-execute cycle.	TPS3	1.3.1	10%		
CO2	Examine memory hierarchy, bus architecture and design cache memory systems with appropriate replacement algorithms considering cost-performance trade-offs.	TPS3	1.3.1	20%		
CO3	Compute performance measures and apply integer/floating-point arithmetic methods to solve execution-time, CPI, speedup, and arithmetic operation problems.	TPS3	1.3.1	20%		
CO4	Analyse processor organization including pipelining mechanisms and evaluate methods to resolve hazards in pipeline execution.	TPS4	2.4.2	20%	SDG 9 (Industry & Innovation)	1
CO5	Design I/O interfacing systems with DMA controllers and peripheral subsystems adhering to industry standards and engineering constraints.	TPS3	1.3.1	15%		
CO6	Analyse GPU architectures and compare performance trade-offs across applications in modern computing systems.	TPS4	3.2.2	15%	SDG 9 (Industry & Innovation)	1

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	20	20			15
CO2	40	40			20

CO3	40	40			20
CO4			40	30	15
CO5			30	30	15
CO6			30	40	15
Total	100	100	100	100	100

5. Syllabus

Computer Architecture Fundamentals :History and overview – evolution from von Neumann to modern architectures; CISC vs RISC – Standards and engineering constraints in computer system design – Instruction Set Architecture (ISA) – instruction formats, addressing modes, instruction types – Measuring performance – CPI, MIPS, Amdahl's law, benchmarks (SPEC) – Bus interconnection – bus structure, synchronous vs asynchronous protocols, arbitration – Instruction cycle – fetch-decode-execute, timing diagrams, data transfer rate estimation

Memory System Organization and Hierarchies: Memory hierarchy – locality of reference, hierarchy levels, cost-performance trade-offs – Cache memory – direct mapping, fully associative, set-associative mapping; LRU/FIFO/LFU replacement – Cache write policies – write-through, write-back, write-allocate; performance impact – Main memory – DRAM/SRAM technologies, interleaved memory, ECC – Virtual memory – paging, segmentation, TLB operation, page replacement algorithms – Memory performance metrics – hit ratio, effective access time, memory bandwidth

Computer Arithmetic: Number systems – binary, octal, hexadecimal; signed representation (2's complement) – Integer arithmetic – addition/subtraction, Booth's algorithm for multiplication, restoring and non-restoring division – Floating-point arithmetic – IEEE 754 standard; FP add/subtract/multiply operations – ALU design – arithmetic and logical operations on binary numbers

Processor organization: CPU structure, register sets, data path design – Cache design trade-offs – block size, associativity level, write policy evaluation - single-cycle and multi-cycle datapath - hardwired and microprogrammed control - instruction timing - pipelining principles - structural, data and control hazards - forwarding, stalls and branch handling - superscalar overview and performance considerations.

I/O Organization, DMA and Peripheral Subsystems: I/O organization – memory-mapped vs isolated I/O; programmed I/O and polling – Interrupt-driven I/O – interrupt handling, priority interrupts, daisy chaining – Direct Memory Access (DMA) – DMA controller operation, cycle stealing, burst mode, transparent DMA – Peripheral subsystems – magnetic disk organization, optical storage, RAID levels-I/O bus standards –I/O interfacing and communication protocols

GPU Architecture and Organization: Introduction to GPU architecture – CPU and GPU architectural differences – GPU processing organization – parallel execution model – GPU memory organization – host-device communication – GPU performance factors – throughput, latency hiding, memory bandwidth and power-performance trade-offs – Applications of GPU

6. Learning Resources

6.1 Text Book

1. William Stallings, *"Computer Organization and Architecture: Designing for Performance"*, 11th edition, Pearson Education, 2019.
2. John L. Hennessy and David A. Patterson, *"Computer Organization and Design: ARM Edition"*, 2nd edition, Morgan Kaufmann (Elsevier), 2020.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Mulpuri, *"Computer Organization and Embedded Systems"*, 6th edition, McGraw-Hill, 2012.

6.2 Reference Books & Web resources

1. Andrew S. Tanenbaum and Todd Austin, *"Structured Computer Organization"*, 6th edition, Pearson, 2013.

2. David A. Patterson and John L. Hennessy, *"Computer Architecture: A Quantitative Approach"*, 6th edition, Morgan Kaufmann, 2019.
3. Hwang, Kai, and Faye A. Briggs. *Computer architecture and parallel processing*. McGraw-Hill, Inc., 1990.
4. Barry B. Brey, *"The Intel Microprocessors: Architecture, Programming and Interfacing"*, 8th edition, Pearson Prentice Hall, 2009.
5. NPTEL COA Course — IIT Madras: https://nptel.ac.in/courses/106106166
6. UC Berkeley CS61C — Great Ideas in Computer Architecture: https://cs61c.org
7. RISC-V Specifications: https://riscv.org/technical/specifications/
8. Burgess, J., 2020. Rtx on—the nvidia turing gpu. *IEEE Micro*, *40*(2), pp.36-44.

7. Course Contents and Lecture Schedule

Module No	Topics	No of Periods
1	**Computer Architecture Fundamentals**	**08**
1.1	History and evolution of computer architecture	02
1.2	CISC vs RISC, engineering constraints	01
1.3	ISA: formats, addressing modes, instruction types	02
1.4	Performance metrics: CPI, MIPS, Amdahl, SPEC	01
1.5	Instruction cycle and timing	02
2	**Memory System Organization and Hierarchies**	**10**
2.1	Memory hierarchy and locality	2
2.2	Cache: direct mapping	2
2.3	Associative mapping and replacement	2
2.4	Cache write policies	1
2.5	Main memory (DRAM, SRAM, ECC)	1
2.6	Virtual memory and TLB	1
2.7	Memory performance metrics	1
3	**Computer Arithmetic:**	**8**
3.1	Number systems and 2’s complement	2
3.2	Integer arithmetic	2
3.3	Booth multiplication	2
3.4	Division algorithms	1
3.5	Floating point and ALU	1
4	**Processor organization:**	**10**
4.1	CPU organization and datapath	2
4.2	Single and multi-cycle datapath	2
4.3	Control unit	2
4.4	Instruction timing and pipelining	1
4.5	Pipeline hazards and handling	2
4.6	Superscalar concepts	1
5	**I/O Organization, DMA and Peripheral Subsystems**	**06**
5.1	I/O organization	1
5.2	Programmed and interrupt I/O	2
5.3	Interrupt handling	2
5.4	DMA concepts	1
5.5	Storage systems	1

6	**GPU Architecture and Organization**	**06**
6.1	Introduction to GPU architecture and CPU-GPU comparison	1
6.2	GPU processing organization	1
6.3	Parallel execution model in GPUs	1
6.4	GPU memory organization	1
6.5	Host-device communication and performance factors	1
6.6	GPU applications and power-performance trade-offs	1
	Total Periods	**48**

8. Course Designer(s):

1. Dr.K.Narasimha Mallikarjunan, Associate Professor, CSE arjunkambaraj@tce.edu
2. Dr.R.Harine Rajashree, Assistant Professor, CSE rhrcse@tce.edu

26CSEB0 **PROBLEM SOLVING AND PROGRAMMING**

L	T	P	Credit
3	0	0	3

1. Preamble

The main objective of this course is to introduce the fundamentals of programming and problem-solving. The course aims to develop logical thinking and computational skills required to design efficient solutions for real-world problems. It also provides a strong foundation in structured programming concepts for advanced studies in computing and software development.

2. Prerequisite

NIL

3. Course Outcomes

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

No.	Course Outcome	TPS Level	Performance Indicator	CO Weightage	SDG addressed	SDG Level
CO1	Explain the fundamentals of problem solving, computational thinking, algorithms, pseudocode, and flowcharts for program development.	TPS2	1.3.1	10	SDG 4	1
CO2	Apply data representation concepts, operators, expressions, and type conversion techniques to develop simple programs.	TPS3	1.3.1	15	SDG 4	1
CO3	Apply decision-making and iterative constructs to solve computational problems using control statements and recursion.	TPS3	1.3.1	20	SDG 9	1
CO4	Develop modular programs using functions, parameter passing techniques, storage classes, and reusable code concepts.	TPS3	1.3.1	20	SDG 4	1
CO5	Implement array, string, pointer, searching, sorting, and dynamic memory allocation concepts for problem solving and data processing applications.	TPS3	1.3.1	20	SDG 9	1
CO6	Develop programs using user defined data types, preprocessor directives, command line arguments.	TPS3	1.3.1	15	SDG 4	1

4. Assessment Pattern

CO	CAT1	Assignment 1	CAT2	Assignment 2	Terminal Exam
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	30				10
CO2	30				20

CO3	40	100			20
CO4			40		20
CO5			30		15
CO6			30	100	15
Total	100	100	100	100	100

5. Syllabus

Problem Solving and Program Development

Introduction to problem solving and computational thinking – Problem analysis and decomposition – Algorithms and characteristics of algorithms – Representation of algorithms using pseudocode and flowcharts – Introduction to debugging and test case validation – Syntax, semantic, and runtime errors – Compilation and execution process – Structure of a C program.

Data Representation and Operators

Character set, tokens, identifiers, keywords, constants, variables, and data types – Type conversion and type casting – Input and output operations – Arithmetic, relational, logical, assignment, conditional, and bitwise operators – Expressions, precedence, and associativity – Problem solving using expressions and operators.

Decision Making and Iterative Problem Solving

Decision-making constructs: if, if-else, nested if and switch-case statements – Iterative constructs: while, do-while, and for loops – Nested loops – Iterative control statements: break, continue, and goto – Problem solving using loops and decision-making statements – Introduction to recursive problem solving.

Functions and Modular Programming

Concepts of modular programming – Problem decomposition and reusable code development – Function declaration, definition, and return types – Scope and lifetime of variables – Storage classes – Parameter passing techniques: call by value and call by reference – Recursive functions and applications – Header files and user-defined libraries.

Arrays, Strings, Pointers, and Dynamic Memory Management

One-dimensional and two-dimensional arrays – Array traversal and manipulation – Searching techniques: linear and binary search – Sorting techniques: insertion sort, selection sort, and introduction to other sorting methods – Pointer declaration and initialization – Pointer arithmetic – Arrays and pointers – Strings and pointers – Functions with pointers –Dynamic memory allocation – Memory management practices.

User Defined Data Types and File Handling

Structures, unions, typedef, and enumerated data types – Nested structures – Arrays of structures – Pointers to structures – Structures and functions – File handling concepts – Text and binary files – File input and output operations.

6. Learning Resources

6.1 Text Book

1. B. A. Forouzan and R. F. Gilberg, Computer Programming and Problem Solving, Indian ed. Boston, MA, USA: Cengage Learning, 2020.

2. J. R. Hanly and E. B. Koffman, Problem Solving and Program Design in C, 8th ed. Boston, MA, USA: Pearson, 2015.

3. R. G. Dromey, How to Solve It by Computer: The Problem-Solving Aspects. Englewood Cliffs, NJ, USA: Prentice-Hall International, 1982.

6.2 Reference Books & Web resources

1. B. W. Kernighan and D. M. Ritchie, The C Programming Language, 2nd ed. Upper Saddle River, NJ, USA: Pearson Education, 2015.

2. E. Balagurusamy, Programming in ANSI C, 8th ed. New Delhi, India: McGraw Hill Education, 2019.

7. Course Contents and Lecture Schedule

Module No	Topics	No. of Periods
1	**Problem Solving and Program Development**	
1.1	Introduction to problem solving and computational thinking	1
1.2	Problem analysis, algorithms, and characteristics of algorithms	1
1.3	Representation using pseudocode and flowcharts	1
1.4	Program design methodologies and stepwise refinement	1
1.5	Structure of a C program and compilation process	1
1.6	Syntax, semantic, and runtime errors – Debugging and test case validation	1
2	**Data Representation and Operators**	
2.1	Character set, tokens, identifiers, constants, variables, keywords, and data types	1
2.2	Type conversion, input and output operations	1
2.3	Arithmetic, relational, logical, assignment, conditional, and bitwise operators	1
2.4	Expressions, precedence, and associativity	1
2.5	Decision-making statements: if, if-else, nested if, else-if ladder, and switch-case	1
2.6	Problem solving using expressions and decision-making statements	1
3	**Decision Making and Iterative Problem Solving**	
3.1	Iterative constructs: while, do-while, and for loops	1
3.2	Nested loops and iterative control statements: break, continue, and goto	1

3.3	Problem solving using loops	1
3.4	Concepts of modular programming and reusable code development	1
3.5	Function declaration, definition, return types, and storage classes	1
3.6	Scope and lifetime of variables	1
3.7	Parameter passing techniques: call by value and call by reference	1
3.8	Recursive functions and applications	1
4	**Functions and Modular Programming**	
4.1	One-dimensional arrays: declaration, traversal, and manipulation	1
4.2	Two-dimensional arrays and matrix operations	1
4.3	Searching techniques: linear and binary search	1
4.4	Sorting techniques: insertion sort and selection sort	1
5	**Arrays, Strings, Pointers, and Dynamic Memory Management**	
5.1	Pointer declaration, initialization, and pointer arithmetic	1
5.2	Address and indirection operators	1
5.3	Arrays, strings, and pointers	2
5.4	Functions with pointers and pointer to pointer concepts	2
5.5	Dynamic memory allocation and memory management practices	1
6	**User Defined Data Types and File Handling**	
6.1	Structures, unions, typedef, and enumerated data types	1
6.2	Nested structures, arrays of structures, and pointers to structures	1
6.3	Structures with functions and command line arguments	1
6.4	Preprocessor directives and macros	1
6.5	File handling concepts – Text and binary files - file input and output operations	1
	Total Periods	**36**

8.Course Designer(s):

1. Dr. M. P. Ramkumar, Assosiate Professor, CSE, ramkumar@tce.edu.

2. Mrs. P. Swetha, Assistant Professor, CSE , psacse@tce.edu

26CSCD0	COMPUTER SYSTEM DESIGN LAB	Category	L	T	P	Credits
		PC	0	0	3	1.5

Preamble

Computer System Design Lab provides hands-on experience to students and helps them to gain practical exposure to system exploration, number systems, logic design, OS commands, C programming, networking diagnostics, and system performance measurement. Each experiment is designed to bridge conceptual knowledge and real-world system interaction, progressively building competence from guided (Level 1) to open-ended (Level 2) investigations.

Prerequisite

- Basics of Computer System Design concepts namely architecture, organization, and operational principles of modern computing systems.

Course Outcomes

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

COs	Course Outcome 1 (CO1)	TCE Proficiency Scale	Performance Indicators	SDG Addressed	SDG Level
CO1	Apply system exploration techniques to identify computer hardware components, software environments and logic design using appropriate tools.	TPS 3	1.4.1		
CO2	Apply operating system installation procedures to make computer system operational.	TPS 3	5.2.1		
CO3	Apply application software management techniques in standalone computing systems to support user interaction.	TPS 3	5.2.1		
CO4	Apply command-line operations and system monitoring utilities to manage processes, memory, and resources in computing systems.	TPS 3	5.2.1		
CO5	Apply networking commands and internet configuration techniques to establish and verify local network connectivity.	TPS 3	5.2.1	SDG9	1
CO6	Demonstrate the characteristics of computer system in various system workloads	TPS 3	5.2.1		
CO7	Prepare structured laboratory reports and communicate experimental observations effectively.	TPS3	9.1.1		
CO8	Assess the system performance and resource utilization using monitoring tools and infer system behavior under varying workloads.	TPS3	5.2.1	SDG9	1

Assessment Pattern: Cognitive Domain

Type of Assessment	Component	Marks	Remarks
Continuous Assessment	Pre-lab, In-lab, Post-lab	75	Conducted throughout the semester

Model Test	CO-wise (Cognitive, Psychomotor, Affective)	25	Mid/End semester internal test
Total Internal Marks		**100**	
End Semester Examination	CO-wise (Cognitive, Psychomotor, Affective)	100	As directed by COE or as per curriculum

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1.	System Exploration: Identifying Computer Components	1	Models	CO1
2.	Logic Gate Simulation using Digital Logic Simulator	1	Experimentation	CO1
3.	Installation of Windows OS and its operation	1	Experimentation	CO2
4.	Installation of Linux OS and its operation	2	Experimentation	CO2
5.	Installation and usage of application software packages in Windows	1	Experimentation	CO3
6.	Installation and usage of application software packages in Linux	2	Experimentation	CO3
7.	System Performance Monitoring	2	Experimentation	CO4
8.	Establishing network connectivity, Networking Commands and Connectivity Testing	1	Experimentation	CO5
9.	System Workload Profiling and Analysis	1	Data Analysis	CO6
10.	Embedded and Edge Computing Platform Exploration	1	Data Analysis	CO6

Course Designer(s):

1. Dr.S.Prasanna, Associate Professor ,CSE sprcse@tce.edu
2. Dr.G.Madhupriya, Associate Professor ,CSE gmadhupriya@tce.edu

26CSCE0	PROGRAMMING LAB	Category	L	T	P	Credits
		PC	0	0	3	1.5

Preamble

The main objective of this course is to introduce the fundamentals of programming and problem-solving. The course aims to develop logical thinking and computational skills required to design efficient solutions for real-world problems. It also provides a strong foundation in structured programming concepts for advanced studies in computing and software development.

Prerequisite

NIL

Course Outcomes

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

COs	Course Outcome (CO)	TCE Proficiency Scale	Performance Indicators	SDG Addressed	SDG Level
CO1	Apply computational thinking and problem-solving techniques to design algorithmic solutions.	TPS3	1.3.1	SDG 4	1
CO2	Use appropriate data representation and programming constructs to develop solutions for computational problems.	TPS3	1.3.1	SDG 4	1
CO3	Apply control structures to implement structured solutions for real-world problems.	TPS3	1.3.1	SDG 9	1
CO4	Demonstrate modular program development using functions and reusable programming concepts.	TPS3	1.3.1	SDG 4	1
CO5	Apply data processing techniques and memory management concepts to develop efficient programs.	TPS3	5.1.1	SDG 9	1
CO6	Develop and document structured programs using advanced programming constructs and effective coding practices.	TPS3	8.2.1	SDG 4	1

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	End semester internal test
Total Internal Marks		**100**	
End Semester Examination	CO-wise (Cognitive, Psychomotor, Affective)	100	As directed by COE or as per curriculum

List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Objective(s)	COs Addressed
1	Write a program using Decision-Making Statements in C	1	Models	CO2

2	Construct Programs Using Looping Statements	1	Experimentation	CO2
3	Implement Modular Programs Using User-Defined Functions	1	Design	CO3
4	Create Programs Using Header Files and User-Defined Libraries	1	Communication	CO3
5	Perform Array Operations Using One-Dimensional and Two-Dimensional Arrays	2	Data Analysis	CO4
6	Develop String Handling Programs in C	2	Creativity	CO4
7	Demonstrate Dynamic Memory Allocation Techniques	2	Learn from failures	CO5
8	Build Programs Using Structures and Unions	2	Models	CO6
9	Construct Record Management Programs Using Arrays of Structures	2	Teamwork	CO6
10	Perform File Handling Operations in C Programming	2	Ethics & Integrity	CO6
11	Develop a Mini Project Integrating C Programming Concepts	3	Communication + Creativity	CO1-CO6

Course Designer(s):

1. Dr. M. P. Ramkumar, Assosiate Professor, CSE, ramkumar@tce.edu.
2. Mrs. P. Swetha, Assistant Professor, CSE , psacse@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
CO 1	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
CO 2	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
CO 3	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
CO 4	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
CO 5	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
CO 6	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
CO 7	Analyse deviations and experimental errors in titrimetric, electrochemical, and instrumental	TPS 4	4.3.1	SDG 9 – Industry,	2

	methods, and recommend corrective measures to improve analytical accuracy.			Innovation and Infrastructure	
CO 8	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, Psychomotor Skills	CO2, CO3, CO5
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):

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

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.

Prerequisite

NIL

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

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.

Syllabus

Module 1:

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

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.

Learning Resources

- தமிழக வரலாறு – மக்களும் பண்பாடும் (மற்றும் கல்வியியல் பணிகள் கழகம் தமிழ்நாடு பாடநூல் :வவளியீடு)
- கணித் தமிழ் – முனைவர் இல.சுந்தரம் விகடன் பிரசுர)ம்(
- கீழடி – னவனக நதிக்கனரயில் சங்ககால நாகரீகம் வதால்லியல் துனை) (வவளியீடு
- வபாருனந ஆற்ைங்கனர நாகரீகம் (வதால்லியல் துனை வவளியீடு)
- Social Life of the Tamil – The Classical Period (Dr.K.K.Pillay) A joint publication of TNTB&ESC and RMRL – (inprint)
- Social Life of the Tamils- The Classical Period (Dr.S.Singaravelu) Published by: International Institute of 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

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)

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