B.E. CIVIL ENGINEERING DEGREE PROGRAMME

CURRICULUM AND DETAILED SYLLABI

FOR

FIRST AND SECOND SEMESTER

FOR THE STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2026-27 ONWARDS

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

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

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
26CHSA0	Engineering Chemistry	BSC	3	-	-	3
THEORY CUM PRACTICAL						
26EGHA0	Technical English	HSMC	2	-	2	3
26CECA0	Building Materials and Technology	PCC	2	-	2	3
26MEEA0	Engineering Graphics	ESC	1	-	4	3
26CCEA0	Introduction to Engineering	ESC	1	-	2	2
PRACTICAL						
26CHSC0	Chemistry Laboratory	BSC	-	-	3	1.5
AUDIT COURSES						
26TAAA0	Heritage of Tamil	AC				-
26CCAA0	Vision and Speed Maths	AC				-
		Total				**19.5**

SECOND SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			Credits
			L	T	P	
THEORY						
26CESA0	Matrices Vector Calculus and Differential Equations	BSC	2	1	-	3
26PHSA0	Physics	BSC	3	-	-	3
26CECB0	Engineering Mechanics	PCC	3	1	-	4
26CECC0	Engineering Surveying	PCC	3	-	-	3
26CEEA0	Concrete Technology	ESC	3	-	-	3
26CCEB0	Biology for Engineers	ESC	3	-	-	3
PRACTICAL						
26CECD0	Surveying and Levelling Laboratory	PCC	-	-	3	1.5
26CECE0	Computer Aided Drafting Laboratory	PCC	-	-	3	1.5
26PHSB0	Physics 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	26MASA0	Applied Calculus for Engineers	3	40	60	100	27	50
2	26CHSA0	Engineering Chemistry	3	40	60	100	27	50
THEORY CUM PRACTICAL								
3	26EGHA0	Technical English	3 (Terminal Exam Type : Theory)	50	50	100	22.5	50
4	26CECA0	Building Materials and Technology	3 (Terminal Exam Type : Theory)	50	50	100	22.5	50
5	26MEEA0	Engineering Graphics	3 (Terminal Exam Type : Practical)	50	50	100	22.5	50
6	26CCEA0	Introduction to Engineering	3 (Terminal Exam Type : Practical)	50	50	100	22.5	50
PRACTICAL								
7	26CHSC0	Chemistry Laboratory	3	60	40	100	18	50

SECOND SEMESTER

S.No	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	26CESA0	Matrices Vector Calculus and Differential Equations	3	40	60	100	27	50
2	26PHSA0	Physics	3	40	60	100	27	50
3	26CECB0	Engineering Mechanics	3	40	60	100	27	50
4	26CECC0	Engineering Surveying	3	40	60	100	27	50
5	26CEEA0	Concrete Technology	3	40	60	100	27	50
6	26CCEB0	Biology for Engineers	3	40	60	100	27	50
PRACTICAL								
7	26CECD0	Surveying and Levelling Laboratory	3	60	40	100	18	50
8	26CECE0	Computer Aided Drafting Laboratory	3	60	40	100	18	50
9	26PHSB0	Physics Laboratory	3	60	40	100	18	50

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	

B.E. CIVIL ENGINEERING - 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	10			
I	**26MASA0** Applied Calculus for Engineers (BSC-4)	**26CHSA0** Engineering Chemistry (BSC-3)	**26EGHA0** Technical English (TCP) (HSMC-3)	**26CECA0** Building Materials and Technology (TCP-T) (PCC-3)	**26MEEA0** Engineering Graphics (TCP) (ESC-3)					**26CHSC0** Chemistry Laboratory (BSC-1.5)	**26CCEA0** Introduction to Engineering (TCP) (ESC-2)	**26TAAA0** Heritage of Tamil/ **26CCAA0** Vision and Speed Maths (AC-0)	19.5
II	**26CESA0** Matrices Vector Calculus and Differential Equations (BSC-3)	**26PHSA0** Physics (BSC-3)	**26CECB0** Engineering Mechanics (PCC-4)	**26CECC0** Engineering Surveying (PCC-3)	**26CEEA0** Concrete Technology (ESC-3)	**26CCEB0** Biology for Engineers (ESC-3)		**26CECD0** Surveying and Levelling Laboratory (PCC-1.5)	**26CECE0** Computer Aided Drafting Laboratory (PCC-1.5)	**26PHSB0** Physics Laboratory (BSC-1.5)		**26TAAB0** Tamil and Technology/ **26CCAB0** Foundations of Problem Solving-1(AC-0)	23.5
III	**26CESB0** Maths-III (BSC-3)	**26CECF0** Mechanics of Solids (PCC-3)	**26CECG0** Water Supply Engineering (PCC-3)	**26CEEB0** Fluid Mechanics (ESC-3)	**26CEEC0** Python Programming (ESC-3)			**26CCLA0** Building Communication Skills (EEC-1)	**26CECH0** Digital Survey Laboratory (PCC-1.5)	**26CECJ0** Material Testing Laboratory (PCC-1.5)	**26CCEC0** Design Thinking (ESC-3)	**26CCAC0** Constitution of India (AC-0)	22
IV	**26CESC0** Maths-IV (BSC-3)	**26CECK0** Structural Analysis (PCC-3)	**26CECL0** Hydraulic and Hydraulic Machinery (PCC-3)	**26CECM0** Wastewater Engineering (PCC-3)	**PEC-1 (3)**	**26CCED0** Environment and Sustainability (ESC-3)	**26EGHB0** Professional Communication Lab (HSMC-2)	**26CCLB0** Numerical Skills and Quantitative Problem Solving (EEC-1)	**26CECN0** Environmental Engineering Laboratory (PCC-1.5)	**26CECP0** Fluid Mechanics Laboratory (PCC-1.5)		**26CCAD0** Indian Knowledge System (AC-0)	24
V	**26CCHA0** Project Management (HSMC-3)	**26CECQ0** Soil Mechanics (PCC-3)	**26CECR0** Highway and Railway Engineering (PCC-3)	**26CECS0** esign of Steel Elements (PCC-3)	**26CECT0** Design of RCC Elements (PCC-3)	**PEC-2 (3)**	Basic Science Elective / Language Elective (OEC-3)	**26CCLC0** Aptitude Skills (EEC-2)	**26CECU0** Structural Mechanics Laboratory (PCC-1.5)	**26CECV0** Project Planning Laboratory (PCC-1.5)	**26CELA0** Project-I (EEC-3)	**26CCAE0** Universal Human Values and Ethics (AC-0)	29
VI	**26CCHB0** Accounting and Finance (HSMC-3)	**26CECW0** Foundation Engineering (PCC-3)	**26CECX0** Design of Steel Structures (PCC-3)	**26CECY0** Design of RCC Structures (PCC-3)	**PEC-3 (3)**	**PEC-4 (3)**	Interdisciplinary Elective (OEC-3)		**26CECZ0** Soil and Highway Engineering Laboratory (PCC-1.5)	**26CEDA0** Structural Design and Detailing Laboratory (PCC-1.5)	**26CELB0** Project-II (EEC-3)	**26CCAF0** Disaster Management (AC-0)	27
VII	**PEC-5 (3)**	**PEC-6 (3)**	**PEC-7 (3)**	**26CEDB0** Irrigation and Water Resources Engg. (PCC-3)	**26CEDC0** Prestressed Concrete (PCC-3)	**26CEDD0** Green and Sustainable Construction (PCC-3)	**26CEDE0** Construction Management (PCC-2)		**26CEDF0** Estimation and Costing Laboratory (PCC-1.5)	**26CEDG0** Analysis and Design Laboratory (PCC-1.5)	**26CELC0** Project-III (EEC-3)		26
VIII											**26CELD0** Project-IV (EEC-3)		3
Total Credits													174

Passed in Board of Studies meeting on 23.05.2026

Approved in 71st Academic Council meeting on 27.06.2026

26CECA0	BUILDING MATERIALS AND TECHNOLOGY	Category	L	T	P	Credits	TE
		PCC	2	0	2	3	TCP-T

1.Preamble

This theory-cum-laboratory course is designed to provide students with comprehensive exposure to the theoretical concepts of various construction materials and techniques, along with their practical applications. The course also offers an overview of the planning and design aspects of residential building components, including ventilation requirements in accordance with NBC provisions. It also aims to enhance students' ability to apply theoretical knowledge to practical construction-related problems through laboratory and field-based learning experiences.

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	Choose appropriate natural, manufactured and sustainable construction materials by evaluating their properties and performance, conduct tests on bricks.	TPS 3	1.4.1	15%	SDG 12	1
CO2	Apply suitable construction techniques for substructure and superstructure components: Plinth; DPC and demonstrate various brick masonry bonds	TPS 3	1.4.1	20%	SDG 9	1
CO3	Apply suitable methods for constructing arches, lintels, floors, roofs, and stairs	TPS 3	1.4.1	20%	SDG 11	1
CO4	Apply appropriate finishing and support techniques in construction works	TPS 3	1.4.1	15%	SDG 11	1
CO5	Apply building code requirements for material storage, assess project sites, and select suitable tools and machinery according to construction needs	TPS 3	6.2.1	20%	SDG 11	1
CO6	Use NBC guidelines to plan residential buildings for various plot sizes with proper ventilation requirements	TPS 3	6.2.1	10%	SDG 11	1

4.Assessment Pattern

CO	Theory		Practical		Terminal Exam
	CAT1	CAT2	OCR/Continuous Assessment	Model Test CO-wise	
	% of Marks	% of Marks	% of Marks	% of Marks	% of Marks
CO1	30	-	15	100	15
CO2	30	-	20		15
CO3	40	-	15		20
CO4	-	30	15		15
CO5	-	50	20		25
CO6	-	20	15		10
Total	100	100	100	100	100

Assessment Pattern: Practical Component

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

5.Syllabus

Module1:

Materials for Construction

Natural materials - stones, aggregates, timber, lime. Man- made materials: bricks, cement, steel, concrete, plastics, fly ash, GGBS, Silica fume, PCC and RCC, Composite materials – properties, types and applications- Tests on bricks

Module 2:

Technologies for Construction

Classification of Load-Bearing Systems in Buildings - Section through a wall – Building Components and its purposes - Substructure- types of foundation- Damp Proof Course. Types of Masonry-Stone, Brick, Block masonry – classification, method of construction, applications–Bonds in brick masonry – Stretcher, Header, English, Flemish and Zig-zag bonds

Module 3:

Technologies for Construction

Classification of Lintels and Arches, Floors and flooring, Roofs and Roofing, Stairs- types and details of construction

Module 4:

Finishes, Temporary Supports and Special Construction Techniques

Wall finishes: Plastering, Pointing, Paining and Ceiling Finishes: False ceiling, Gypsum board finish, POP finish. Centering and Scaffolding, Special Construction Techniques: Shoring and Underpinning

Module 5:

Storage, site suitability and choice of machinery:

NBC provisions for material storage at site: Bricks, Cement, Timber, Steel, Lime, Aggregates, Paints and Chemicals. Classification of buildings as per National Building Codal

(NBC)- Site suitability assessment and its influencing factors for different Civil Engineering structures- Choice of tools and machinery for various construction practices

Module 6:

Orientation and ventilation of Buildings

NBC provisions for components of residential buildings: Set back with respect to width of road in front, Open spaces, Living room, Bed room, Kitchen, Bathroom and Water closet. NBC provisions for ventilation in buildings- types of ventilation

6.Text Book

1. Varghese. P.C, “Building Materials”, 2nd Edition PHI Learning Ltd., 2015
2. B. C. Punmia, Ashok Kumar Jain, & Arun Kumar Jain, “Building Construction” 12th edition). Laxmi Publications Pvt. Ltd., 2025

6.1Reference Books & web resources

1. Arora S.P and Bindra S.P Building Construction, Dhanpat Rai and sons, 2013
2. Varghese.P.C, Building Construction, 2nd Edition PHI Learning ltd., 2016.
3. S. C. Rangwala, Engineering Materials, Charotar Publishing House, 2019.
4. National Building Code of India, Bureau of Indian Standards, 2016
5. Basic Construction Materials, IITM https://nptel.ac.in/courses/105106206
6. Modern Construction Materials, IITM https://nptel.ac.in/courses/105106053

7.SDG Alignment

Activities aligned with SDGs addressed:

1. SDG 11: Students will prepare a building assessment report related to a real time case study residential building:
   a. Identify the construction materials used (natural, manufactured, sustainable materials).
   b. Examine masonry types, finishing works, roofing, provisions.
   c. Verify provisions of NBC related to site selection, dimensions of components and ventilation, in the case study building
2. SDG 11: Propose sustainable improvements such as: eco-friendly materials, improved ventilation, daylight utilization, safer scaffolding/construction practices and waste reduction methods.

8.Course Contents and Lecture Schedule

Module No	Topics	No of Periods	Course Outcomes
1.0 Materials for Construction			
1.1	Natural materials – Stones: origin, types, Engineering Properties and recommended qualities as a building material - applications	2	CO1
1.2	Natural materials – Aggregates: types, Engineering Properties and recommended qualities as a building material - applications		
1.3	Natural materials – Timber: properties and qualities as a building material- seasoning - applications	2	
1.4	Natural materials – Lime: Types, properties, recommended qualities as a building material, applications		
1.5	Man- made materials: bricks, cement, steel, concrete, PCC and RCC: manufacturing process, types, properties, recommended qualities as a building material. Tests on bricks	2	

1.6	Other materials: glass, plastics, fly ash, GGBS, Silica fume – sources, properties and applications	2	
1.7	Composite materials – properties, types and applications Case study buildings constructed with natural and man-made materials		
2 .0 Technologies for Construction- Load bearing systems, Foundation and DPC			
2.1	Classification of Load-Bearing Systems in Buildings: Load-Bearing Wall System, Framed Structural System, Composite Structural System	2	CO2
2.2	Section through a wall – Building Components and its purposes	2	
2.3	Substructure- types of foundation, suitability; Damp Proof Course- types, applications for different situations	2	
2.4	Types of Masonry- Stone masonry– classification, method of construction, applications; Block masonry- applications	2	
2.5	Brick masonry – Bonds, method of construction, applications	2	
3.0 Technologies for Construction: Lintels, Arches, Floors, Roofs and Stairs			
3.1	Classification of Lintels and Arches - classification (material used, construction method, shape), applications	2	CO3
3.2	Floors and flooring: types (Structural floor and finishes), applications	2	
3.3	Roofs and Roofing: Types (Structural Roofs and Finishes), applications	2	
3.4	Stairs – types with applications	2	
3.5	Case study of components in buildings	1	
4.0 Finishes, Temporary Supports and Special Construction Techniques			
4.1	Wall finishes: Plastering, Pointing, Painting – types, methods of construction, applications - case study building example	2	CO4
4.2	Ceiling Finishes: False ceiling, Gypsum board finish, POP finish– methods of laying, applications	2	
4.3	Scaffolding and Centering – types, methods of construction, applications – case study building example	2	
4.4	Shoring, Underpinning- types, applications	2	
5.0 Storage, site suitability and choice of machinery			
5.1	NBC provisions for material storage at site: Bricks, Cement, Timber, Steel, Lime, Aggregates, Paints and Chemicals.	3	CO5
5.2	Classification of buildings as per National Building Codal (NBC)- Site suitability assessment and its influencing factors for different Civil Engineering structures	2	
5.3	Choice of tools and machinery for various construction practices	2	
6.0 Orientation and ventilation of Buildings			
6.1	Classification of buildings as per NBC provisions. Site selection and its influencing factors – case study example buildings	2	CO6
6.2	National Building Codal (NBC) provisions for components of residential buildings: Set back with respect to width of road in front, Open spaces, Living room, Bed room, Kitchen, Bathroom and Water closet.	2	

6.3	NBC provisions for ventilation aspects in buildings- natural (Wind and Stack effects) and artificial means of ventilation in buildings	2	
	Total Periods	48	

9.List of Experiments with CO Mapping

S.No.	Name of the Experiment	Level of Experiment	Objective(s)	COs addressed
1.	Tests on bricks (Field test for accessing quality, water absorption and Compressive Strength test)	1	Experimentation	CO1
2.	Demonstrate different types bonds in brick masonry work – Stretcher bond, header bond and English bond	1	Experimentation	CO2
3.	Demonstrate different types bonds in brick masonry work– Flemish bond and zigzag bond	1	Experimentation	CO2
4.	Identify and classify the different types of stone masonry in the campus	1	Models	CO2
5.	Identify and classify the different types of staircases in the campus	1	Models	CO3
6.	Determine the geometrical parameters of dog legged stair in the campus	1	Experimentation	CO3
7.	a) Identify and classify the different types of roofs and false ceiling materials provided in the campus discussing its features b) Identify and classify the different types of floors and finishes provided in the campus discussing its features	1	Models	CO3
8.	Identify and report the various finishes and temporary support structures (scaffolding) in the campus	1	Models	CO4
9.	a) Identify and report storage measures for different building materials used at construction sites of the campus b) Identify and report different tools and equipment used for various construction activities in the campus	2	Data Analysis	CO5
10	Apply NBC provisions and plan components of residential buildings for the given plot size with ventilation requirements	1	Models	CO6

10.Course Designer(s):

Dr. G. Chitra, Professor, Dept of Civil gcciv@tce.edu
Mr. S. Kannan, Asst. Prof., Dept. of Civil erkannan@tce.edu
Ms. R. Abinaya Rajakumari, Asst. Prof., Dept of Civil rarciv@tce.edu
Dr. V. Ganga, Asst. Prof., Dept of Civil vgaciv@tce.edu

26CESA0	MATRICES VECTOR CALCULUS AND DIFFERENTIAL EQUATIONS	Category*	L	T	P	Credit
		BSC	2	1	0	3

1. Preamble

This course aims to enable the students of Civil Engineering to analyze structural systems, evaluate fluid and field behaviours, and solve dynamic equations for infrastructure design and analysis. It also develops analytical and problem-solving skills through eigenvalue decomposition, vector differential and integral calculus, and second order ordinary differential equations used in bridges, mass-spring oscillatory systems, and structural stability problems.

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	Compute eigenvalues and eigenvectors of a matrix, verify their properties, and perform similarity transformation.	TPS3	1.1.1	17	SDG4	2
CO2	Apply eigenvalues and eigenvectors to diagonalize matrices and reduce quadratic forms to canonical form.	TPS3	1.1.1	20	SDG4	2
CO3	Compute gradient, directional derivative, divergence, and curl of vector fields and determine field properties.	TPS3	1.1.1	13	SDG4	2
CO4	Use Stoke's and Gauss's Divergence Theorems to evaluate line and surface integrals.	TPS3	1.1.1	20	SDG4	2
CO5	Solve homogeneous second-order linear ODEs with constant coefficients and Cauchy–Euler type using characteristic equations.	TPS3	1.1.1	20	SDG4	2
CO6	Solve nonhomogeneous second-order linear ODEs using variation of parameters.	TPS3	1.1.1	10	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	34	34			17
CO2	40	40			20
CO3	26	26			13
CO4			40	40	20
CO5			40	40	20
CO6			20	20	10
Total	**100**	**100**	**100**	**100**	**100**

5. Syllabus

Module 1:
Matrix Eigenvalue Problems: Eigenvalues and Eigenvectors – Properties of Eigenvalues and Eigenvectors – Similarity Transformation
Module 2:
Matrix Eigenvalue Problems (Continued): Diagonalization of a matrix – Quadratic Forms.
Module 3:
Vector Differential Calculus: Gradient of a Scalar Field – Directional Derivative – Divergence of a Vector Field – Curl of a Vector Field.
Module 4:
Vector Integral Calculus: Line Integrals – Surface Integrals – Divergence Theorem of Gauss – Stoke's Theorem.
Module 5:
Second Order Linear Homogeneous Ordinary Differential Equations: Homogeneous Linear Ordinary Differential Equations of Second Order – Homogeneous Linear Ordinary Differential Equations with Constant Coefficients – Euler-Cauchy Equations.
Module 6:
Nonhomogeneous Ordinary Differential Equations: Solution by Variation of Parameters.

6. Learning Resources

6.1 Text Book

3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley, 10th edition, 2017.
   Module 1: 8.1
   Module 2: 8.4
   Module 3: 9.7 - 9.9
   Module 4:10.1, 10.6, 10.7, 10.9
   Module 5: 2.1, 2.2, 2.5
   Module 6: 2.10

6.2 Reference Books & Web resources

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, 42nd Edition, 2017.
2. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning, 7th Edition, 2017.
3. Glyn James, Phil Dyke, "Advanced Modern Engineering Mathematics", 5th Edition, Pearson Education Limited, 2018.
4. https://nptel.ac.in/courses/111105121
5. https://nptel.ac.in/courses/111105122

7. Course Contents and Lecture Schedule

Module No.	Topics	No of Periods
1	**Matrix Eigenvalue Problems**	
1.1	Eigenvalues and eigenvectors	2
	Tutorial	1
1.2	Properties of Eigenvalues and Eigenvectors	1
1.3	Similarity transformation	1
	Tutorial	1
2	**Matrix Eigenvalue Problems (Continued)**	
2.1	Diagonalization of a matrix	2
	Tutorial	1
2.2	Quadratic forms	2
	Tutorial	1
3	**Vector Differential Calculus**	
3.1	Gradient of a scalar field	1
3.2	Directional derivative	1
	Tutorial	1
3.3	Divergence of a vector field	1
3.4	Curl of a vector field	1
	Tutorial	1
4	**Vector Integral Calculus**	
4.1	Line integrals	2
	Tutorial	1
4.2	Surface integrals	1
4.3	Gauss divergence theorem	1
	Tutorial	1
4.4	Stokes' theorem	2
	Tutorial	1
5	**Second Order Linear Ordinary Differential Equations**	
5.1	Homogeneous linear ODEs of second order	1
5.2	Homogeneous Linear ODEs with constant coefficients	1
	Tutorial	1
5.3	Euler–Cauchy equations	2
	Tutorial	1
6	**Nonhomogeneous Ordinary Differential Equations**	
6.1	Solution by Variation of Parameters	2
	Tutorial	1
	Total Periods	36

8.Course Designer(s):

1. Dr. K. Saravanakumar, kskmat@tce.edu
   Assistant Professor, Department of Mathematics
2. Dr. P. Jeyadurga, pjdmat@tce.edu
   Assistant Professor, Department of Mathematics
3. Dr. A. Muneesh Kumar, amkmat@tce.edu
   Assistant Professor, Department of Mathematics

		Category*	L	T	P	Credit
26CECB0	**ENGINEERING MECHANICS**	PCC	3	1	0	4

1.Preamble

Engineering Mechanics deals with forces and their effects on rigid bodies at rest or in motion. Essential for engineering as it applies principles of physics (like Newton's laws) and mathematics to analyze structures and machine components.

A structure is made up of constituent elements like beam, column and membrane. The constituent elements should have adequate size to resist applied loads to build a safe structure. Their size is decided by material properties of the elements, particularly their strength.

2.Prerequisite

Basic concepts of Physics and Mathematics

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	Solve practical problems through laws of mechanics and by applying equilibrium concepts	TPS3	1.3.1	10	-	0
CO2	Compute geometric properties of sections	TPS3	1.5.1	15	-	0
CO3	Apply the concept of stress and strain, stress transformation to solve structural mechanics problem	TPS3	1.4.1	25	-	0
CO4	Calculate shear force and bending moment and construct shear force and bending moment diagrams	TPS3	1.5.1	20	-	0
CO5	Determine bending and shear stresses for various sections	TPS3	1.4.1	20	-	0
CO6	Apply theories of failure for design of components	TPS3	1.4.1	10	-	0

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**	**-**	**-**	**10**
CO2	**30**	**30**	**-**	**-**	**15**
CO3	**50**	**50**	**-**	**-**	**25**
CO4	**-**	**-**	**40**	**40**	**20**
CO5	-	-	40	40	20
CO6	**-**	**-**	**20**	**20**	**10**
Total	**100**	**100**	**100**	**100**	**100**

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

5.Syllabus

Module1:

Statics of Particles and Rigid Bodies - Laws of Mechanics - Lame's theorem, Parallelogram and triangular law of forces - Coplanar forces - Resolution and composition of forces - Equilibrium of a particle - Principle of transmissibility. Types of supports and reactions - Moments and couples - Varignon's theorem - Equilibrium of rigid bodies.

Module 2:

Properties of surfaces - First moment of area and centroid of sections - Second Moment of area - Moment of Inertia - Parallel Axis Theorem - Perpendicular axis theorem - Polar Moment of Inertia - Radius of Gyration - Principal moments of inertia**.** Development of spread sheets for calculating moment of inertia for composite sections

Module 3:

Simple Stresses and Strains - : Introduction, stress, strain, tensile, compressive and shear stress – Hooke's law – Young's modulus, rigidity modulus, Bulk modulus, Poisson's ratio, Volumetric strain, relationship between elastic constants. Thermal stress and strain – Principal stresses and strains – Mohr's circle

Module 4:

Shear Force and Bending Moment - Introduction, types of beams – cantilever, simply supported over hanging, fixed and continuous beams. Types of loads – concentrated load, uniformly distributed load, uniformly varying load and couples. Shear force and bending moment diagram for statically determinate beams (cantilever, simply supported and over hanging). Spread sheets**-** Algorithm for constructing SFD and BMD for statically determinate beam

Module 5

Bending and shear stresses - Theory of simple bending – assumptions – bending stress formula – computation of bending stress – bending stress distribution diagram – computation of shear stress – shear stress distribution diagram (for rectangular, T and I sections)

Module 6

Theories of Failure - Maximum principal stress theory-Maximum shear stress theory-shear strain energy theory.- Design of elements based on theories of failure

6. Learning Resources

6.1 Text Book

1.R.K.Rajput- Strength of Materials, 8th edition, S,Chand& company limited, New Delhi, 2025.

6.2 Reference Books & Web resources

1. Timoshenko. S.P. and Young D.H., —Elements of Strength of Materials‖, 5th edition (SI Units), Affiliated East-West Press Ltd., New Delhi, 2012.
2. Ferdinand P. Beer and E. Russell Johnston Jr, —Mechanics of Materials‖, McGraw Hill Book Company, Singapore, 1992.
3. Egor. P. Popov, —Mechanics of Materials‖, Prentice Hall, 1976.
4. https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_me70
5. https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_me70

7. Course Contents and Lecture Schedule

Module No.	Topic	No. of Periods
1.0	**Statics of Particles and Rigid Bodies**	
1.1	Laws of Mechanics - Lame's theorem, Parallelogram and triangular law of forces.	1
1.2	Coplanar forces - Resolution and composition of forces - Equilibrium of a particle - Principle of transmissibility	1
1.3	Types of supports and reactions - Moments and couples - Varignon's theorem - Equilibrium of rigid bodies	2
	Tutorial	1
2.0	**Properties of surfaces**	
2.1	First moment of area and centroid of sections - Second Moment of area - Moment of Inertia	1
2.2	Parallel Axis Theorem - Perpendicular axis theorem - Polar Moment of Inertia - Radius of Gyration - Principal moments of inertia	2
	Tutorial	2
	Spread sheets- Algorithm for developing spread sheet for calculating moment of inertia for composite section	2
3.0	**Simple stresses and strains**	
3.1	Introduction to stress and strain, tensile, compressive and shear stress and strain.	1
3.2	Hooke's law, Young's Modulus, Rigidity Modulus, Bulk Modulus, Poisson's Ratio.	2
3.3	Relationship between elastic constants , Stress-strain diagram for mild-steel, Elastic Limit	2
	Tutorial	1
	Principal stresses and strains	
3.4	Plane Stress and Plane Strain, Analytical method	2
3.5	Principal stresses and strains, Mohr's circle method	2
	Tutorial	1
4.0	**Shear Force and Bending Moment**	
4.1	Introduction to types of beams – Cantilever, Simply Supported, Overhanging, Fixed and, Continuous Beams	2

Module No.	Topic	No. of Periods
	Introduction to types of loads - Concentrated Load, Uniformly Distributed Load, Uniformly Varying Load, Couples	
4.2	Shear Force and Bending Moment diagram for cantilever beams	1
4.3	Shear Force and Bending Moment diagram for simply supported beams.	2
4.4	Shear Force and Bending Moment diagram for overhanging beams.	1
	Tutorial	2
	Spread sheets- Algorithm for constructing SFD and BMD for statically determinate beam	2
5.0	**Bending and shear stresses**	
5.1	Theory of simple bending and assumptions	1
5.2	Bending stresses in various sections - (Rectangular, T and I sections)	2
	Tutorial	2
5.3	Shear stress in various sections – (Rectangular, T and I sections)	2
	Tutorial	2
6.0	**Theories of Failure**	
6.1	Maximum Principal Stress Theory	2
6.2	Maximum Shear Stress Theory	1
6.3	Shear Strain Energy Theory	1
	Tutorial	2
	Total (36+12)	48

8.Course Designer(s):

1. Dr. S. Nagan, Professor, Department of Civil Engineering (nagan_civil@tce.edu)
2. Dr. D. Brindha, Professor, Department of Civil Engineering (dbciv@tce.edu)
3. Dr. R. Indrajith Krishnan, Assistant Professor, Department of Civil Engineering (jith@tce.edu)

26CECC0	ENGINEERING SURVEYING

Category*	L	T	P	Credit
PCC	3	0	0	3

1.Preamble

Surveying is a fundamental branch of Civil Engineering that deals with the measurement and mapping of the physical features of the earth's surface. The course provides knowledge of surveying principles, instruments and modern techniques used for planning, design and execution of engineering projects. It enables students to acquire practical skills in field measurements, preparation of maps and setting out works essential for infrastructure development.

2.Prerequisite

Basic knowledge of Engineering Mathematics and Geometry

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	Demonstrate the use of chain, compass and plane table surveying techniques for accurate field measurements and surveying calculations.	TPS3	1.3.1	15	SDG 9	1
CO2	Apply levelling methods to determine reduced levels and compute areas and volumes using standard numerical methods.	TPS3	1.3.1	20	SDG9	1
CO3	Apply tacheometric surveying methods to measure angles, distances and elevations using stadia and tangential methods.	TPS3	1.3.1	15	SDG9	1
CO4	Apply trigonometrical levelling and triangulation techniques to determine heights, distances and baseline measurements in surveying.	TPS3	1.3.1	20	SDG9 & SDG11	1
CO5	Apply curve surveying techniques for setting out simple and compound curves in engineering projects.	TPS3	1.3.1	15	SDG9 & SDG11	1
CO6	Apply modern surveying instruments and techniques for accurate field measurements and mapping.	TPS3	5.2.1	15	SDG9 & SDG11	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	40	-	-	15
CO2	40	30	-	-	20
CO3	30	30	-	-	15

CO4	-		40	30	20
CO5	-		30	30	15
CO6	-		30	40	15
Total	**100**	**100**	**100**	**100**	**100**

5.Syllabus

Module1:

Fundamental concepts of surveying: Principles of surveying – Classification-Plans and maps-scales-Chain surveying-Ranging and Chaining-Errors and obstacles in chaining. Compass surveying-Magnetic declination-local attraction. Plane table surveying-Accessories-Methods of plane tabling.

Module 2:

Levelling: Methods of levelling-Temporary adjustments-Differential levelling-Profile levelling-Reciprocal levelling-Reduced levels-Height of instrument-Rise and fall method- Calculation of areas and volumes-Mid ordinate-Average ordinate-Trapezoidal rule-Simpson's method.

Module 3:

Tacheometric Survey: Theodolite- Temporary adjustments-Measurement of horizontal and vertical angle-Principle of Stadia tacheometry-Instrument constants-Anallactic lens-Horizontal distance and Elevation-Tangential tacheometry-Horizontal distance and heights of objects. Contours-Characteristics and uses.

Module 4:

Trigonometrical levelling: Heights and distances-Base of object accessible-Base of the object inaccessible-Single plane method-Double plane method-**Triangulation:** Classification-Triangulation systems- Selection of triangulation station-signals and towers-Baseline measurement.

Module 5:

Curves: Elements of simple circular curve-Setting out of simple curves-Linear methods of setting out-Instrumental methods-Elements of compound curves-Setting out of compound curve-Elements of reverse curve-Transition curves-Types of vertical curves.

Module 6:

Modern methods of Surveying: Electro-Magnetic Distance Measurement (EDM)-Types of EDM instruments- Total station and its application-Global Positioning System (GPS)-Differential Global Positioning System (DGPS)-Drone survey.

6.Learning Resources

6.1 Text Book

1. Punmia,B.C, Ashok K Jain and Arun K Jain, " Surveying" Volume-I Laxmi Publication, 18th Edition, 2024.
2. Punmia,B.C, Ashok K Jain and Arun K Jain, " Surveying" Volume-II, Laxmi Publication, 17th Edition, 2019.

6.2 Reference Books & Web resources

1. Venkatramaiah C, "Textbook of Surveying", University Press, 2nd Edition, 2011.
2. S. K. Duggal, "Surveying Vol. I" McGraw Hill India 5th Edition, 2020
3. S. K. Duggal, "Surveying Vol.II" McGraw Hill India 5th Edition, 2019
4. R. Subramanian, "Surveying and Levelling", Oxford University Press India, 2nd Edition, 2025
5. P. K. Garg, "Introduction to Surveying and Geomatics Engineering", Khanna Publishers, 2024

7. Course Contents and Lecture Schedule

Module No	Topics	No of Periods
1	**Fundamental concepts of surveying**	
1.1	Principles of surveying, Classification, Plans and maps and scales	1
1.2	Ranging and Chaining, Errors and obstacles in chaining	1
1.3	Bearings and angles using compass, calculation of Included angle	1
1.4	Magnetic declination and Local attraction	1
1.5	Plane table surveying- Accessories and their uses, Methods of plane tabling-Radiation and Intersection	1
1.6	Three point problem-Trial and Error, Bessel's,	1
1.7	Three point problem-Right angle and Tracing sheet methods- Two point problem	1
2	**Levelling**	
2.1	Methods of levelling-Temporary adjustments	1
2.2	Differential levelling-Profile levelling-Reciprocal levelling	1
2.3	Reduced levels-Height of instrument-Rise and fall method	2
2.4	Calculation of areas and volumes-Mid ordinate-Average ordinate-Trapezoidal rule-Simpson's method.	2
3	**Tacheometric Survey**	
3.1	Theodolite- Temporary adjustments-Measurement of horizontal and vertical angle	1
3.2	Principle of Stadia tacheometry-Instrument constants-Anallactic lens	1
3.3	Horizontal distance and Elevation by stadia tacheometry	2
3.4	Horizontal distance and heights of objects by tangential tacheometry	1
3.5	Contours-Characteristics and uses.	1
4	**Trigonometrical levelling**	
4.1	Heights and distances-Base of object accessible	1
4.2	Base of the object inaccessible-Single plane method	2
4.3	Base of the object inaccessible-Double plane method	1
4.4	**Triangulation:** Classification-Triangulation systems	1
4.5	Selection of triangulation station-signals and towers	1
4.6	Baseline measurement	1
5	**Curves**	
5.1	Elements of simple circular curve-Setting out of simple curves	1
5.2	Offsets from long chord and successive bisection of arcs	1
5.3	Offsets from tangents and Offsets from chords produced	1
5.4	Angular methods of setting out simple circular curve- Rankine's method of deflection angles	1
5.5	Elements of compound curves- Setting out of compound curve	1
5.6	Elements of reverse curve.	1
5.7	Transition curves-Types of vertical curves	1
6	**Modern methods of Surveying**	
6.1	Electro-Magnetic Distance Measurement (EDM)-Types of EDM instruments	1
6.2	Total station and its application	1
6.3	Global Positioning System (GPS)-Differential Global Positioning System (DGPS) and Drone survey	1
	Total	36

8.Course Designer(s):

Dr.T.Baskaran, Professor, Department of Civil Engg., tbciv@tce.edu
Dr.R.Ponnudurai, Associate Professor, Department of Civil Engg., rpdciv@tce.edu

26CECD0	SURVEYING AND LEVELLING LABORATORY	Category	L	T	P	Credits
		PCC	0	0	3	1.5

1.Preamble

The Survey Laboratory course provides practical training in fundamental surveying techniques and instruments used in civil engineering. Students perform chain, compass, plane table and levelling surveys to prepare maps, profiles and contour plans. The course develops skills in field data collection, analysis, teamwork and professional reporting for engineering applications.

2.Prerequisite

Simple mathematical calculations and Engineering drawing

3. Course Outcomes

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

CO	CO Statement	TPS Level	PI	Objective	SDG Addressed	SDG Level
CO1	Apply chain and compass surveying techniques for ranging, chaining, area computation, included angle measurement and local attraction correction.	TPS3	5.2.1	1	9	1
CO2	Conduct plane table surveying using radiation, intersection and resection methods for preparation of field plans and graphical solutions.	TPS3	5.2.1	1	9	1
CO3	Determine elevations and reduced levels using fly and differential levelling techniques.	TPS3	4.1.2	4,6	9	1
CO4	Prepare longitudinal profiles, cross-sections and contour maps using levelling and contouring techniques for terrain analysis.	TPS4	4.3.1	4,6	11 & 15	1
CO5	Select and use appropriate conventional surveying instruments and field procedures while recognising accuracy, limitations and safety aspects in surveying practice.	TPS3	7.2.1	3,10	8 & 9	1
CO6	Perform surveying experiments individually and in teams, record observations and prepare professional field reports.	TPS3	9.1.2	11,12	4	1

*Note: TPS Level (TPS3–TPS5), PI format (x.y.z)

4.Assessment Pattern: Cognitive Domain

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

5.List of Experiments with CO Mapping

Sl. No.	Name of the Experiment	Level of Experiment	Laboratory Objective(s) *	COs Addressed
1.	Ranging and chaining techniques to prepare chain survey layouts.	01	01, 03, 06, 11, 12, 13	CO1,CO5, CO6
2.	Compute the area of a closed traverse using chain surveying measurements.	01	01, 03, 06, 11, 12, 13	CO1, CO5, CO6
3.	Determine included angles from compass survey observations	01	01, 03, 06, 11, 12, 13	CO1, CO5, CO6
4.	Identify and correct local attraction errors in compass surveying.	01	01, 03, 06, 11, 12, 13	CO1, CO5, CO6
5.	Radiation and intersection methods in plane table surveying for locating details.	01	01, 03, 06, 11, 12, 13	CO2, CO5, CO6
6.	Tracing paper method to solve the three-point problem in plane table surveying.	01	01, 03, 06, 11, 12, 13	CO2, CO5, CO6
7.	Right-angle method to solve the three-point problem in plane table surveying.	01	01, 03, 06, 11, 12, 13	CO2, CO5, CO6
8.	Bessel's method to solve the three-point problem in plane table surveying.	01	01, 03, 06, 11, 12, 13	CO2, CO5, CO6
9.	Two-point problem in plane table surveying for station orientation.	01	01, 03, 06, 11, 12, 13	CO2, CO5, CO6
10.	Determine the elevations of given points using fly levelling.	01	01, 03, 04, 06,11,12,13	CO3, CO5, CO6
11.	Compute the difference in elevation between two points by differential levelling.	01	01, 03, 04, 06,11,12,13	CO3, CO5, CO6
12.	Prepare the longitudinal profile of the ground using profile levelling	02	01, 03, 04, 06,11,12,13	CO4, CO5, CO6
13.	Conduct cross-section levelling to obtain transverse ground profiles.	02	01, 03, 04, 06,11,12,13	CO4, CO5, CO6
14.	Prepare contour map of an area from levelling data.	02	01, 03, 04, 06,11,12,13	CO4, CO5, CO6

* refer guidelines for Practical Course Design

6.Course Designer(s):

Dr.T.Baskaran, Professor, Department of Civil Engg., tbciv@tce.edu
Dr.R.Ponnudurai, Associate Professor, Department of Civil Engg., rpdciv@tce.edu