DEPARTMENT OF CIVIL ENGINEERING

I TO VIII SEMESTER
CURRICULUM AND SYLLABI

Applicable to the students admitted to

R-2021: CBCS

Academic year 2021-2022
onwards

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

#60, Avadi – Vel Tech Road, Vel Nagar,
Avadi, Tamil Nadu 600062

LIST OF ABBREVIATIONS

S. No.	Abbreviations	Detailed Description
1	**HSMC**	Humanities & Social Science including Management Courses
2	**BSC**	Basic Science Courses
3	**ESC**	Engineering Science Courses
4	**PCC**	Professional Core Courses
5	**PEC**	Professional Elective Courses
6	**OEC**	Open Elective Courses
7	**PROJ**	Project Work
8	**EEC**	Employability Enhancement Courses
9	**MC**	Mandatory Courses

Category Based Credit Split-Up – Semester Wise

Semester	HSMC	BSC	ESC	PCC	PEC	OEC	Project /EEC	MC	Total Credit
1	3	12	10	-	-	-	-	1	**26**
2	3	7	7	7	-	-	-	1	**25**
3	-	4	-	17	-	-	-	-	**21**
4	-	4	-	16	-	-	1	0	**21**
5	-	-	-	18	-	3	1	-	**22**
6	-	-	-	15	3	3	1	-	**22**
7	-	-	-	13	6	-	3	0	**22**
8	-	-	-	-	6	-	6	-	**12**
Total Credits	**6** (4%)	**27** (16%)	**17** (10%)	**86** (51%)	**15** (9%)	**6** (3%)	**12** (7%)	**2** (0.01%)	**171**

B.E. – Civil Engineering Curriculum (R2021)

SEMESTER I										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EN11T	Communicative English	HSMC	40	60	100	3	0	0	3
2	21MA12T	Matrices and Differential Calculus	BSC	40	60	100	3	1	0	4
3	21PH13T	Engineering Physics I	BSC	40	60	100	3	0	0	3
4	21CY14T	Engineering Chemistry	BSC	40	60	100	3	0	0	3
5	21CS15IT	Problem Solving and Python Programming	ESC	50	50	100	2	0	4	4
6	21ME16T	Engineering Graphics	ESC	40	60	100	2	0	4	4
7	21MC04T	தமிழர் மரபு / Heritage of Tamils	MC	40	60	100	1	0	0	1
PRACTICAL										
8	21BS17P	Physics and Chemistry Laboratory	BSC	60	40	100	0	0	4	2
9	21ME18P	Engineering Practices Laboratory	ESC	60	40	100	0	0	4	2
TOTAL										**26**

SEMESTER II										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EN21T	Technical English	HSMC	40	60	100	3	0	0	3
2	21MA22T	Vector Calculus and ComplexIntegration	BSC	40	60	100	3	1	0	4
3	21PH23T	Engineering physics II	BSC	40	60	100	3	0	0	3
4	21EE24T	Basic Electrical, Electronics andInstrumentation Engineering	ESC	40	60	100	3	0	0	3
5	21CE25T	Construction Materials	PCC	40	60	100	3	0	0	3
6	21ME26T	Engineering Mechanics	ESC	40	60	100	3	1	0	4
7	21MC05T	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	MC	40	60	100	1	0	0	1
PRACTICAL										
8	21CE27P	Construction Materials laboratory	PCC	60	40	100	0	0	4	2
9	21CE28P	Computer Aided Building Drawing Laboratory	PCC	60	40	100	0	0	4	2
TOTAL										**25**

SEMESTER III										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21CE31T	Surveying Instruments and Measurements	PCC	40	60	100	3	0	0	3
2	21CE32T	Strength of Materials I	PCC	40	60	100	3	1	0	4
3	21CE33T	Fluid Mechanics	PCC	40	60	100	3	0	0	3
4	21MA34T	Series, Transforms and Partial Differential equations	BSC	40	60	100	3	1	0	4
5	21CE35T	Engineering Geology	PCC	40	60	100	3	0	0	3
6	21MC01T	Constitution of India	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21CE37P	Strength of Materials Laboratory	PCC	60	40	100	0	0	4	2
8	21CE38P	Surveying Laboratory	PCC	60	40	100	0	0	4	2
TOTAL										**21**

SEMESTER IV										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21CE41T	Concrete Technology	PCC	40	60	100	3	0	0	3
2	21CE42T	Strength of Materials II	PCC	40	60	100	3	1	0	4
3	21CE43T	Applied Hydraulics Engineering	PCC	40	60	100	3	0	0	3
4	21MA44T	Numerical Methods	BSC	40	60	100	3	1	0	4
5	21CE45IT	Basics of Applied Soil Mechanics	PCC	50	50	100	2	0	4	4
6	21MC02T	Environmental Sciences	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21CE47P	Hydraulic Engineering Laboratory	PCC	60	40	100	0	0	4	2
8	21EE01P	Mini Project – I	EEC	60	40	100	0	0	2	1
TOTAL										**21**

SEMESTER V										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21CE51T	Design of Reinforced Concrete Elements	PCC	40	60	100	3	1	0	4
2	21CE52T	Analysis of Structures I	PCC	40	60	100	3	0	0	3
3	21CE53T	Principles of Foundation Engineering	PCC	40	60	100	3	0	0	3
4	21CE54T	Water Supply Engineering	PCC	40	60	100	3	0	0	3
5	21CE55IT	Highway Engineering	PCC	50	50	100	2	0	4	4
6	-	Open Elective I	OEC	40	60	100	3	0	0	3
PRACTICAL										
7	21EE03P	Technical Seminar	EEC	100	-	100	0	0	2	1
8	21CE58P	Survey Camp	PCC	60	40	100	0	0	0	1
TOTAL										**22**

SEMESTER VI										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21CE61T	Waste Water Engineering	PCC	40	60	100	3	0	0	3
2	21CE62T	Design of Steel Structures	PCC	40	60	100	3	1	0	4
3	21CE63T	Analysis of Structures II	PCC	40	60	100	3	0	0	3
4	21CE64T	Irrigation Engineering and Water Management	PCC	40	60	100	3	0	0	3
5	-	Professional Elective - I	PEC	40	60	100	3	0	0	3
6	-	Open Elective - II	OEC	40	60	100	3	0	0	3
PRACTICAL										
7	21CE67P	Environmental Engineering Laboratory	PCC	60	40	100	0	0	4	2
8	21EE02P	Mini Project - II	EEC	60	40	100	0	0	2	1
TOTAL										**22**

SEMESTER VII										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21CE71T	Estimation, Costing and Valuation Engineering	PCC	40	60	100	3	0	0	3
2	21CE72T	Construction Management	PCC	40	60	100	3	0	0	3
3	21CE73T	Structural Design and Drafting	PCC	40	60	100	3	1	0	4
4	21CE74T	Prestressed Concrete Structures	PCC	40	60	100	3	0	0	3
5	-	Professional Elective - II	PEC	40	60	100	3	0	0	3
6	-	Professional Elective - III	PEC	40	60	100	3	0	0	3
PRACTICAL										
7	21EE05P	Project Phase - I	PROJ	60	40	100	0	0	4	2
8	21EE04P	Internship	EEC	100	-	100	0	0	0	1
TOTAL										**22**

SEMESTER VIII										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	-	Professional Elective - IV	PEC	40	60	100	3	0	0	3
2	-	Professional Elective - V	PEC	40	60	100	3	0	0	3
PRACTICAL										
3	21EE06P	Project Phase - II	EEC	60	40	100	0	0	12	6
TOTAL										**12**

LIST OF PROFESSIONAL ELECTIVE COURSES

S. No.	Course Code	Engineering Stream Courses
Professional Elective-I		
1	21CE651PT	Disaster Management
2	21CE652PT	Geographic Information System
3	21CE653PT	Total Station and GPS Surveying
4	21CE654PT	Ground Improvement Techniques
5	21CE655PT	Urban Planning and Development
Professional Elective-II		
6	21CE751PT	Housing Planning and Management
7	21CE752PT	Bridge Engineering
8	21CE753PT	Finite Element Methods
9	21CE754PT	Building Planning and Drawing
10	21CE755PT	Structural Dynamics and Earthquake Engineering
Professional Elective-III		
11	21CE761PT	Ground water Engineering
12	21CE762PT	Engineering Hydrology
13	21CE766PT	Industrial Project Planning
14	21CE764PT	Pre Fabricated Structures
15	21CE765PT	Green Concepts in Civil Engineering
Professional Elective-IV		
16	21CE811PT	Environmental Pollution Control and Safety Management
17	21CE812PT	Maintenance Repair and Rehabilitation of Structures
18	21CE813PT	Professional Ethics and Human Values
19	21CE814PT	Computer Aided Design of Structures
20	21CE815PT	Smart Infrastructures I
Professional Elective-V		
21	21HE652PT	Principles of Management
22	21CE822PT	Construction Planning and Scheduling
23	21CE823PT	Environmental and Social Impact Assessment
24	21CE824PT	Railways, Airports, Docks and Harbour Engineering
25	21CE825PT	Smart Infrastructures II

LIST OF OPEN ELECTIVE COURSES

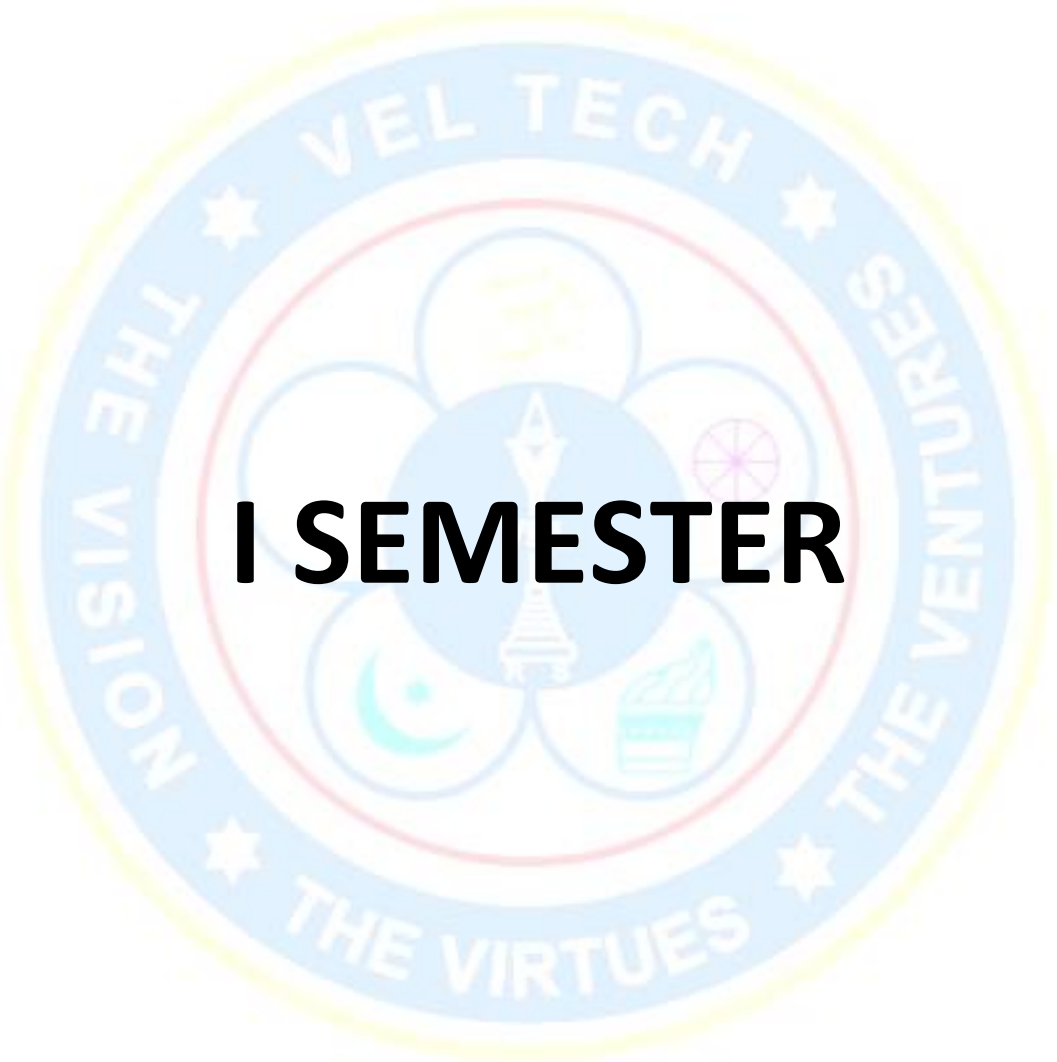
S. No	COURSE CODE	OFFERING DEPARTMENT	NAME OF THE COURSE
1	21CS01OT	CSE	Bio Python
2	21CS02OT		Cyber Security
3	21CS03OT		Java Programming
4	21CS04OT		Database System Design
5	21IT01OT	IT	Business Intelligence
6	21HI52T		Data Analytics
7	21IT03OT		Augmented Reality and Virtual Reality
8	21IT04OT		Introduction to Cloud Computing
9	21AI651PT	AI & DS	Advanced Python Programming
10	21AI31T		Introduction to Artificial Intelligence
11	21AI03OT		Machine Learning Techniques for Engineers
12	21ML33T		Python for Data Science
13	21EC01OT	ECE	Microcontroller System Design
14	21EC743PT		Digital Image Processing
15	21EC03OT		Internet of Things and Applications
16	21EC556PT		Automotive Electronics
17	21ME01OT	MECHANICAL	Industry 4.0
18	21ME02OT		Robotics and Industrial Automation
19	21ME03OT		3D Printing
20	21ME04OT		Fundamentals of Electric and Hybrid Vehicles
21	21CE01OT	CIVIL	Traffic Engineering and Management
22	21CE02OT		Air Pollution Control Engineering
23	21CE763PT		Municipal solid waste management
24	21CE04OT		Safety in Civil Engineering Practices
25	21BT01OT	BIOTECHNOLOGY	Basics of Environmental Biotechnology
26	21BT02OT		Introduction to Biofuels and Bioenergy
27	21BT03OT		Lifestyle Diseases: A Biotechnological Approach
28	21BT04OT		Biology for Engineers
29	21CH25T	CHEMICAL	Principles of Chemical Engineering
30	21CH02OT		Process Modeling and Simulation
31	21CH03OT		Energy Management and Audit
32	21CH04OT		Process Plant Utilities
33	21MB01OT	MBA	Business Intelligence for Administration
34	21MB02OT		Personality Development
35	21MB03OT		Entrepreneurship Development
36	21EN01OT	S & H	Foreign Language – French
37	21PH02OT		Fundamentals of Photovoltaic and its Applications
38	21CY03OT		Recent Trends in Batteries
39	21CY04OT		Green Chemistry

LIST OF HONORS COURSES

S. No	COURSE CODE	DEPARTMENT	NAME OF THE COURSE
1	21CE01HT	CIVIL	Transportation Systems Planning
2	21CE02HT		Sustainable Urban and Transport Planning
3	21CE03HT		Transportation Economics
4	21CE04HT		Road Safety System
5	21CE05HT		Intelligent Transportation Systems
6	21CE06HT		Logistics In Transportation Engineering

LIST OF NPTEL COURSES

1	Introduction to Multimodal Urban Transportation Systems (MUTS)
2	Sustainable Transportation Systems



I SEMESTER

SEMESTER I										
S. No.	**Course Code**	**Course Title**	**Category**	**CIE Marks**	**SEE Marks**	**Total marks**	**Credits**			
							L	**T**	**P**	**C**
THEORY										
1	21EN11T	Communicative English	HSMC	40	60	100	3	0	0	3
2	21MA12T	Matrices and Differential Calculus	BSC	40	60	100	3	1	0	4
3	21PH13T	Engineering Physics I	BSC	40	60	100	3	0	0	3
4	21CY14T	Engineering Chemistry	BSC	40	60	100	3	0	0	3
5	21CS15IT	Problem Solving and Python Programming	ESC	50	50	100	2	0	4	4
6	21ME16T	Engineering Graphics	ESC	40	60	100	2	0	4	4
7	21MC04T	தமிழர் மரபு / Heritage of Tamils	MC	40	60	100	1	0	0	1
PRACTICAL										
8	21BS17P	Physics and Chemistry Laboratory	BSC	60	40	100	0	0	4	2
9	21ME18P	Engineering Practices Laboratory	ESC	60	40	100	0	0	4	2
TOTAL										**26**

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21EN11T	Semester	I			
Category	HUMANITIES & SOCIAL SCIENCE INCLUDING MANAGEMENT COURSES (HSMC)		L	T	P	C
Course Title	COMMUNICATIVE ENGLISH (COMMON FOR ALL BRANCHES)		3	0	0	3

COURSE OBJECTIVES:

- To exhibit the students of Engineering and Technology to develop their listening and to recall the pattern of listening.
- To facilitate the learners to develop speaking skills to convey their ideas and views in the real context.
- To develop their reading skills and grasp the central ideas of the text.
- To expose them to acquire writing technique with basic grammar.
- To motivate the students to use appropriate vocabulary in academic and categorize the inferences in writings.

PREREQUISITE:

- Foundation of language with Basic English Grammar.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C101. 1	***Listen*** to different talks and lectures and understand them easily.	K1
C101. 2	***Communicate*** their thoughts confidently using communicative strategies	K2
C101. 3	***Read*** and grasp different genres of texts effortlessly	K2
C101. 4	***Write*** grammatically correct academic, business and technical texts	K3
C101. 5	***Apply*** the appropriate vocabulary to communicate efficiently in all forms of communication.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C101. 1	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101. 2	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101. 3	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101. 4	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101. 5	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101. 6	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I BASIC GRAMMAR I AND READING FOR INFORMATION 9

PRACTICAL

LISTENING: Listening to short dialogues with good accent

SPEAKING : Introducing oneself - Exchanging personal information

TUTORIAL

READING : Reading short comprehension passages- practice skimming and scanning for specific information

WRITING: Parts of speech - Sentence patterns – Tenses – 'wh'- questions - Yes/No questions -Countable and Uncountable nouns

VOCABULARY AND GRAMMAR: Affixation – word formation - Synonyms and Antonyms.

UNIT II BASIC GRAMMAR II AND SHARING INFORMATION 9

PRACTICAL

LISTENING : Listening to documentaries - inspiring speeches of great leaders and practicing opinion sharing

SPEAKING : Self-introduction - peer introduction - picture description - JAM

TUTORIAL

READING: Note-making- Critical reading finding key information in a given text - shifting facts from opinions and paraphrasing

WRITING: Autobiographical writing (writing about one's leisure time activities, hometown - favourite place and school life) - Biographical writing (place, people)

VOCABULARY AND GRAMMAR: Compound Words – Guessing meaning of words contexts - One Word substitutes – Pronouns- Adjectives – Adverbs – Imperatives - Direct and Indirect questions.

UNIT III BASIC GRAMMAR III AND FREE WRITING 9

PRACTICAL

LISTENING : News Bulletins - Ted talks - telephonic conversations

SPEAKING : functions of Language - giving reasons - talking about future plans - comparing and contrasting - making suggestions

TUTORIAL

READING: Current Affairs - newspaper reading /magazines - loud in the classroom

WRITING: Coherence and cohesion in writing- cause and effect - compare & contrast and narrative & analytical paragraphs.

VOCABULARY AND GRAMMAR: Discourse marker - Reference words - Process description - Conjunctions – Prepositions - Articles - Degrees of comparison.

UNIT IV BASIC GRAMMAR IV AND FREE WRITING 9

PRACTICAL

LISTENING : Listen to audio/ Conversation from BEC/IELTS /TOFEL.

SPEAKING : Interpersonal Skills: Role play/group discussion/debate/ conduct of meeting

TUTORIAL

READING: Reading different types of texts /genres/ for comprehension and pleasure – related with human values.

WRITING: Letter writing (informal letters) and formal letters – rejecting and accepting Letters - Personal emails and etiquette.

VOCABULARY AND GRAMMAR: Single Word substitutes - Use of abbreviations Acronyms - Cloze reading - interpreting visual materials - Jumbled sentences - Subject verb agreement - Modal verbs - Phrasal verbs.

UNIT V BASIC GRAMMAR V AND LANGUAGE DEVELOPMENT 9

PRACTICAL

LISTENING : Listen to official meetings to know about the project proposal.

SPEAKING : Discussing the project and the proposals in the group - Creative writing and speaking - Poster making and description - project proposals.

TUTORIAL

READING: Reading comparison and contrast text with the deeper level of meaning **WRITING :** Essay writing - different types of essays - dialogue writing

VOCABULARY AND GRAMMAR: Word association (connotations) - Lexical items (fixed / semi fixed expressions) - Clause - Direct and indirect speech - Correction of errors.

Total: 45 Periods

Extensive Reading:

Kalam , Abdul. The Wings of Fire , Universities Press, Hyderabad. 19

LEARNING RESOURCES:

TEXT BOOKS:

1. Board of Editors, Department of English, Anna University, Chennai. Using English:A Course Book for Undergraduate Engineers and Technologists, Orient Black Swan: Chennai,2017.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai,2011.

REFERENCES:

1. Raman, Meenakshi & Sangeetha Sharma, Technical Communication: English Skills for Engineers. Oxford University Press, NewDelhi.2011.

2. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2006

3. Rizvi M, Ashraf. Effective Technical Communication. Tata McGraw- Hill Publishing Company Limited, New Delhi, 2007.

4. Rutherford, Andrea J. Basic Communication Skills for Technology. Pearson Edition (II Edition), NewDelhi, 2001.

5. Mandel, Steve. *Effective Presentation Skills*. New Delhi: Viva Books Pvt. Ltd., 2004.

6. Kilmet, Stephen. "The Resume and "The Computerized Resume." In Writing for Design Professionals.

7. Writing Cover Letters-Kilmet, Stephen. "Cover Letter, "and" Enclosures and Attachments." in Writing for Design Professionals New York.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21MA12T	Semester	I			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	MATRICES AND DIFFERENTIAL CALCULUS (COMMON FOR ALL BRANCHES)		3	1	0	4

COURSE OBJECTIVES:

- To apply advanced matrix knowledge to solve engineering problems
- To improve their ability in solving geometrical applications of differential calculus
- To familiarize with the application of differential equations

PREREQUISITE:

- Basic Mathematics skills at 12^{th} level

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C102.1	***Solve*** Engineering problems using matrices.	K3
C102.2	***Use*** various test to discuss the convergence of infinite series.	K2
C102.3	***Apply*** the geometrical concepts to solve differential calculus.	K4
C102.4	***Compute*** partial derivatives of functions of several variables.	K2
C102.5	***Apply in Engineering many physical initial*** and boundary value problems can be described by ODE.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C102.1	3	3	-	-	-	-	-	-	-	-	-	-
C102.2	3	2	-	-	-	-	-	-	-	-	-	-
C102.3	3	3	-	-	-	-	-	-	-	-	-	-
C102.4	3	2	-	-	-	-	-	-	-	-	-	-
C102.5	3	2	-	-	-	-	-	-	-	-	-	-
C102	3	2	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I MATRICES 12

Matrix operations, special types of matrices, matrices as linear transformations, linear independence, Orthogonalization, Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley – Hamilton theorem, Orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformations- Nature of quadratic forms.

UNIT II INFINITE SERIES 12

Sequences of real numbers-Series-General properties of series-Comparison test- Integral test, D' Alemberts ratio test and Cauchy's root test- Power series, radius and interval of convergence of power series, Convergence of exponential, logarithmic and Binomial Series, Properties of uniformly convergence series

UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS 12

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelops – Evolute as envelope of normals

UNIT IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES 12

Limits and Continuity –Partial derivatives –Homogeneous Functions-Total derivative –Change of variables –Jacobian and properties –Taylor's series for functions of two variables –Maxima and minima of functions of two variables –Lagrange's method of undetermined multipliers.

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 12

Second and Higher Order Equations, homogeneous and non-homogeneous linear equations and linear systems with constant coefficients, method of variation of parameters, method of undetermined coefficients, Equations reducible to linear equations with constant coefficients-Simultaneous linear equations with constant coefficients.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2015.

REFERENCES:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10thEdition, 2015.
2. M.K. Venkataraman, Engineering Mathematics- First Year, 2nd Edition, National Publishing., Chennai 2001.
3. T. Veerarajan, Engineering Mathematics-I, Tata McGraw Hill Publishing Co, New Delhi, 2017.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21PH13T	Semester	I			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	ENGINEERING PHYSICS I (COMMON FOR ALL BRANCHES)		3	0	0	3

COURSE OBJECTIVES:

- To understand the importance of polarization, optical fiber and Lasers
- To familiar the knowledge of electromagnetic waves oscillations
- To understand the importance of quantum physics
- To cognize the basics of heat and thermodynamics
- To express the basics of crystal physics

PREREQUISITE:

- High School Maths and Physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C103.1	***Utilize*** the concepts of polarization, optical fiber and Lasers for engineering applications	K3
C103.2	***Apply*** the knowledge of electromagnetic waves oscillations	K3
C103.3	***Understand*** the importance of quantum physics.	K2
C103.4	***Cognize*** the basics of heat and thermodynamics	K2
C103.5	***Express*** the basics of crystal physics	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C103.1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C103.2	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C103.3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C103.4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C103.5	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-
C103	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I PHOTONICS 9

Polarization and Fiber Optics: Electromagnetic waves - Production and analysis of linearly, elliptic and circularly polarized light-Polaroid and applications of polarization. Fiber optics - principle of operation – numerical aperture - acceptance angle and applications of fiber optics.

Optical Sources: Characteristics of Lasers - Spontaneous and Stimulated Emission of Radiation - Population Inversion - Einstein's Coefficients and Relation between them - Applications of Lasers.

UNIT II WAVES AND OSCILLATION 9

Oscillatory motion: Differential equation of SHM- Velocity and acceleration- Restoring Force-Frequency response - phase response and resonance-Analogy with LCR circuits and oscillators-Energy and energy loss- Damped oscillations- Significance in control systems - vibration and vibration isolation.

Wave motion: Definition of a plane progressive wave- Attenuation of waves- Phase Velocity-Introduction to numerical methods for solution of wave equation- Importance of spherical and plane wave fronts.

UNIT III QUANTUM MECHANICS 9

Need for Quantum Physics-Historical overviews - Matter waves - De-Broglie's concept of matter waves - Properties of matter waves - Photo electric effect - Heisenberg's uncertainty principle – Statement - Interpretation and application - Schrödinger's time dependent and time independent equations - Operators - Eigen values and Eigen functions - Expectation values -Physical significance of wave function-Quantum superposition and entanglement for Qbits (quantitatively)

UNIT IV HEAT AND THERMODYNAMICS 9

Heat and internal energy - Specific heat and calorimetry - Latent Heat coefficient of linear thermal expansion - Methods of measurement of thermal expansion - Thermal expansion - Applications - The bimetallic strip - Differential equation of one-dimensional heat flow - Lee's disc apparatus for determination of thermal conductivity - Thermal Insulation- Heat dissipation and heat sinking of electronic devices-solid state refrigerators (qualitatively)

UNIT V CRYSTAL PHYSICS 9

Introduction of Crystallography - Space Lattice - Unit Cell - Lattice Parameters – Crystal Systems - Bravais Lattices - Miller Indices and its applications - Crystal Planes and Directions- Inter Planar Spacing of Orthogonal Crystal Systems - Atomic Radius - Co-ordination Number and Packing Factor of SC, BCC, FCC – Crystal growth –Solution growth -Structure determination by x-ray diffraction method (cubic structure).

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Richard Wolfson, "Essential University Physics", Vols. 1 and 2. Pearson Education, Singapore, 2011.
2. Gaur R K, Gupta S L, "Engineering Physics", DhanpatRai Publications, 2013.

REFERENCES:

1. Halliday D., Resnick R. and Walker J., “Fundamentals of Physics”, Wiley Publications,2008.
2. Avadhanulu M. N., “Engineering Physics”, S. Chand & Co., 2007.
3. Purcell E. M., “Electricity and Magnetism – Berkeley Physics Course”, Vol. 2, Tata McGraw-Hill, 2008.
4. Paul A. Tipler and Geene Mosca, “Physics for Scientists and Engineers”, W.H. Freeman and Company, New York, 2004.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CY14T	Semester	I			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	ENGINEERING CHEMISTRY (COMMON FOR ALL BRANCHES)		3	0	0	3

COURSE OBJECTIVES:

- To make the students conversant with water quality parameters and treatment techniques.
- To get the basic idea about the polymers, electrochemistry and corrosion.
- To deal with the information about various types of fuels and energy sources.

PREREQUISITE:

- Basic Chemistry Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C104.1	***Understand*** the water related problems and their treatment techniques.	K2
C104.2	***Explain*** the applications of polymers and reinforced plastics.	K2
C104.3	***Acquire*** knowledge on electrochemistry and corrosion.	K2
C104.4	***Summarize*** the types of fuels and its production process and calculate the CV values.	K2
C104.5	***Classify*** the non-conventional energy sources and its applications.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C104.1	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.2	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.3	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.4	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.5	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I WATER AND ITS TREATMENT 9

Introduction - characteristics - alkalinity - types and determination - hardness - types expression of hardness - units - estimation of hardness of water by EDTA - numerical problems -boiler feed water-requirements-boiler troubles – scale & sludge -disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) -softening of hard water - external treatment process - demineralization and zeolite, internal treatment - boiler compounds (carbonate, phosphate, Calgon, sodium aluminate and colloidal conditioning methods) – desalination of brackish water – reverse osmosis.

UNIT II POLYMERS AND REINFORCED PLASTICS 9

Introduction - classification of polymers - Natural and synthetic - Thermoplastic and Thermosetting, Functionality - Degree of polymerization, Properties of polymers: Tg, Tacticity, Molecular weight - weight average, number average and polydispersity index. Types – addition, condensation and Copolymerization – free radical, cationic and anionic polymerization mechanism

- Preparation, properties and uses of PVC, Nylon- 6,6, Teflon and Epoxy resin. Plastics - Compounding of plastics – moulding methods – injection, extrusion and compression – Engineering plastics-applications-fibre-reinforced plastics (FRP) – carbon and glass– applications.

UNIT III ELECTROCHEMISTRY AND CORROSION 9

Electrochemical cell - redox reaction, electrode potential- origin of electrode potential-oxidation potential-reduction potential - measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion- causes- factors- types: chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints- constituents and function Electroplating of Copper and electroless plating of nickel-Chemical conversion coatings-phosphate, chromate, chemical oxide, and anodized coatings.

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum – refining- manufacture of synthetic petrol (Bergius process) – knocking - octane number- cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) – synthesis, advantages and commercial application of power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value –problems- ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Energy-Types- Non-renewable energy- Nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries - primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells - H_2-O_2 fuel cell.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. P.C. Jain and Monika Jain, Engineering Chemistry, DhanpatRai, Publishing Company (P) Ltd., New Delhi, 2015.
2. S.S Dara&S.S Umare, A Text book of Engineering Chemistry, S.Chand & Company Ltd., New Delhi, 2015.

REFERENCES:

1. S. Vairam,P. Kalyani and Suba Ramesh., Engineering Chemistry, Wiley India Pvt. Ltd, New Delhi, 2013.
2. B.K.Sharma, Engineering Chemistry, Krishna Prakasan Media (P) Ltd., Meerut, 2014.
3. Prasanta Rath, Engineering Chemistry, Cengage Learning India Pvt. Ltd, Delhi, 2015.
4. Shikha Agarwal, Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, 2015.
5. V.R.Gowariker, N.V.Viswanathan, J.Sreedhar, Polymer Science, New Age International (P) Ltd., Publishers, New Delhi, 2011.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CS15IT	Semester	I			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	PROBLEM SOLVING AND PYTHON PROGRAMMING (COMMON FOR ALL BRANCHES)		2	0	4	4

COURSE OBJECTIVES:

- To be familiar with the basics of algorithmic problem solving.
- To construct python programs with conditionals, loops and functions.
- To use python data structures-Lists, Tuples and Dictionaries.

PREREQUISITE:

- Basic Mathematics Skills and Computer Knowledge

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C105. 1	***Develop*** algorithmic solutions to simple computational problems	K3
C105. 2	***Construct*** simple Python programs for solving problems.	K3
C105. 3	***Build*** Python programs with conditionals and loops.	K3
C105. 4	***Demonstrate*** a Python program into functions.	K2
C105. 5	***Show*** compound data using Python lists, tuples, and dictionaries.	K2
C105. 6	***Read*** and write data from/to files in Python Programs.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C105. 1	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 2	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 3	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 4	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 5	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 6	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105	3	2	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT- I ALGORITHMIC PROBLEM SOLVING AND BASICS OF PYTHON 8

Algorithms-building blocks of algorithms (statements, state, control flow, functions), simple Strategies for developing algorithms (iteration, recursion)-pseudo code- flow chart-programming language. Introduction to Python-Features of Python-Python Interpreter: Interactive and script mode- Values and types, variables, Keywords, Identifiers, operators, precedence of operators, expression, Comments.

UNIT-II CONTROL FLOW, FUNCTIONS 8

Conditional statements-Iterative statements, Functions: Built-in functions, user defined function-Function Arguments-Fruitful functions and void functions- local and global variable - function composition- recursion-Lambda Functions.

UNIT-III MODULES, PACKAGES, STRINGS 4

Modules-Packages-Strings-string operations, string functions and methods.

UNIT-IV LISTS, TUPLES, DICTIONARIES 5

Lists- list operations, list methods, list loop, mutability, aliasing, cloning lists-Tuples-Tuple assignment, Operations on Tuples, Tuple as return value- Dictionaries- operations and methods-Sets-Operations on sets.

UNIT-V FILES AND EXCEPTIONS 5

Files –Types of files, file operations, file methods, format operator-command line arguments-Errors and Exceptions, handling exceptions.

List of Experiments: 30 Periods

1. Write a python program to demonstrate basic data types in python.
2. Write a python program using conditional statements.
3. Write a python program using Iterative statements.
4. Write a python program using built-in and user defined functions.
5. Write a python program using lambda functions and recursions.
6. Write a python program to demonstrate Strings and its Operations.
7. Write a python program to demonstrate lists, tuples and its operations.
8. Write a python program to demonstrate Sets and its operations.
9. Write a python program to demonstrate Dictionaries and its operations.
10. Write a python program to demonstrate Files and its Operations.

30 Periods

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Reema Thareja, “Python Programming using Problem Solving Approach”, OXFORD University Press, 2017.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016.

REFERENCES:

1. Ashok Namdev Kamthane, Amit Ashok Kamthane, “Programming and Problem Solving with Python”, Mc-Graw Hill Education, 2018.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd, 2016.
3. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21ME16T	Semester	I			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	ENGINEERING GRAPHICS (COMMON FOR ALL BRANCHES)		2	0	4	4

COURSE OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

PREREQUISITE:

- Engineering Drawing Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C106.1	***Familiarize*** with the fundamentals and standards of Engineering graphics.	K2
C106.2	***Develop*** freehand sketching of basic geometrical constructions and multiple views of objects.	K3
C106.3	***Draw*** orthographic projection of lines and plane surfaces.	K3
C106.4	***Construct*** projection of solids, Section and development of surfaces.	K3
C106.5	***Visualize*** isometric and perspective projections	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C106. 1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C106. 2	3	3	-	-	-	-	-	-	-	-	-	1	1	-	-	-
C106. 3	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-
C106. 4	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-
C106. 5	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-
C106	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

CONCEPTS AND CONVENTIONS (Not for Examination) **1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING **7+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square, Triangle and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three-Dimensional objects – Layout of views– Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE **6+12**

Orthographic projection– principles-Principal Planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method. Applications – Drawing interpretation and process planning, circuit design.

UNIT III PROJECTION OF SOLIDS **5+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method, auxiliary plane method. Applications – Engineering design, automotive modelling, X-rays.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **5+12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Applications – Design of piping, Fabrication, body building, defect analysis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **6 + 12**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones– combination of two solid objects in simple vertical positions – Perspective projection of simple solids–Prisms, pyramids and cylinders by visual ray method and vanishing point method. Applications–constructions, photography, animation and image processing.

Total: 90 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2010.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 51th Edition, 2019.

REFERENCES:

1. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited,2015.
2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 3rd Edition, 2013.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to Semester End Examination on Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. Students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21MC04T	Semester	I			
Category	MANDATORY COURSE (MC)		L	T	P	C
Course Title	*தமிழர் மரபு*		1	0	0	1

SYLLABUS **No. of Credits: 1**

அலகு 1 மொழி மற்றும் இலக்கியம்: 3

திராவிட மொழிகள்- சங்க இலக்கியம்- திருக்குறள் மேலாண்மை கருத்துக்கள்; தமிழ் காப்பியங்கள்; ஐம்பெருங் காப்பியங்களில் தமிழர் பண்பாடு- தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம்

அலகு 2 பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை: 3

ஐம்பொன் சிலைகள்: பழங்குடியினர் தயாரிக்கும் கைவினை பொருட்கள்; தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள்: இசை கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம்.

அலகு 3 நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுகள்: 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, ஒயிலாட்டம், சிலம்பாட்டம், நாட்டுப்புற பாடல்கள்.

அலகு 4 தமிழர்களின் தினை கோட்பாடுகள்: 3

தொல்காப்பியமும் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புற கோட்பாடுகள்: சங்ககால நகரங்களும் துறைமுகங்களும்.

அலகு 5 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு: 3

இந்திய மருத்துவத்தில் சித்த மருத்துவம் மற்றும் ஆயுர்வேத மருத்துவத்தின் பங்கு: தமிழ் புத்தகங்களின் அச்சு வரலாறு.

Total: 15 Periods

அடிகுறிப்புகள்

1) தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2) கீழடி வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

3) பெருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை)

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21MC04T	Semester	I			
Category	MANDATORY COURSE (MC)		L	T	P	C
Course Title	HERITAGE OF TAMILS (COMMON FOR ALL BRANCHES)		1	0	0	1

SYLLABUS **No. of Credits: 1**

UNIT 1 LANGUAGE AND LITERATURE 3

Dravidian Languages – Tamil as Classical Language – Sangam Literature- Aimperum kappiyangalil tamilar panbaadu ; Tamil Epics and Impact of Buddhism & Jainism in Tamil Land.

UNIT 2 HERITAGE – ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Art of Temple Making – Massive Terracotta Sculptures – Art of Temple Care Making; Making of Musical Instruments – Mridhangam, Parai, Veenai, Yazh, Nadhaswaram.

UNIT 3 FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Oyillatam, Silambattam, nattupura padalgal.

UNIT 4 THINAI CONCEPTS OF TAMIL 3

Sangam Literature – Education and Literacy During Sangam Age – Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age.

UNIT 5 CONTRIBUTIONS OF TAMIL TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Culturals Influence of Tamil over the Other Parts of India – Role of Siddha and Ayurvedha in Indigenous System of Medicine – History of Tamil Books.

Total: 15 Periods

REFERENCE:

1) Social Life of Tamils (Dr. K. K. Pillay) A Joint Publications of Tntb & Esc and Rmrl – (in Print)

2) Social Life of the Tamils – The Classical Period (Dr. S Singaravelu)

3) Historical Heritage of Tamils (Dr. S.V Subatamanian, Dr. K.D Thirunavukkarasu)

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21BS17P	Semester	I			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	PHYSICS AND CHEMISTRY LABORATORY (COMMON FOR ALL BRANCHES)		0	0	4	2

COURSE OBJECTIVES:

- To test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To encourage the students to familiarize with experimental determination of velocity of ultrasonic waves and band gap determination.

PREREQUISITE:

- Basic measurement skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C108.1	***Estimate*** the various water quality parameters like alkalinity, hardness (total, temporary, & permanent), dissolved oxygen content, and chloride content.	K2
C108.2	***Investigate*** the metals and ions present in any given sample using various analytical techniques.	K2
C108.3	***Analyze*** the properties such as conductance of solutions, and redox potentials.	K2
C108.4	***Determine*** various moduli of elasticity and also various thermal and optical properties of materials.	K2
C108.5	***Determine*** the velocity of ultrasonic waves, band gap determination and viscosity of liquids.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C108.1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C108.2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C108.3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C108.4	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C108.5	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C108	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

PHYSICS LABORATORY
LIST OF EXPERIMENTS
(Any SIX Experiments)

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Lee's disc Determination of thermal conductivity of a bad conductor
4. Laser- Determination of the wave length of the laser using grating, Estimation of laser parameters
5. Optical fibre -Determination of Numerical Aperture and acceptance angle
6. Ultrasonic interferometer - determination of the velocity of sound and compressibility of Liquids
7. Determination of Band gap of a semiconductor
8. Spectrometer- Determination of wavelength using gating

Total: 30 Periods

REFERENCES:

1. Physics Practicals, Department of Physics, Vel Tech High Tech Dr.Rangarajan Dr.Sakunthala Engineering College 2021
2. Wilson J.D. and Hernandez C.A., "Physics Laboratory Experiments", Houghton Mifflin Company, New York 2005

CHEMISTRY LABORATORY
LIST OF EXPERIMENTS
(Any SIX Experiments)

1. Determination of permanent, total and temporary hardness of water sample.
2. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
3. Determination of DO Content of water sample by Wrinkler's method.
4. Determination of chloride content of water sample by Argentometric method.
5. Determination of strength of given HCl using pH meter.
6. Estimation of Fe^{2+} by Potentiometric titration.
7. Determination of molecular weight of PVA using Ostwald viscometer.
8. Estimation of Iron content in water sample using spectrophotometer (1,10 – Phenanthroline/thiocyanate method).
9. Conductometric titrations of strong acid Vs strong base.
10. Determination of strength of acid in a mixture using conductivity meter.
11. Corrosion experiment-weight loss method.
12. Estimation of sodium and potassium present in water using flame photometer.

Total: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Jeffery G.H., Bassett J., Mendham J. and Denny vogel's R.C, "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
2. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980.
3. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel's Textbook of practical organic chemistry", LBS Singapore (1994).

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21ME18P	Semester	I			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	ENGINEERING PRACTICES LABORATORY (COMMON FOR ALL BRANCHES)		0	0	4	2

COURSE OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering

PREREQUISITE:

- Basic knowledge of engineering skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C109. 1	Demonstrate on Smithy operations, Foundry operations models and machine assembly practice of centrifugal pump and air-conditioner	K2
C109. 2	Experiment with pipe connections and plumbing works	K3
C109. 3	Make use of welding equipment to join the structures.	K3
C109. 4	Explain carpentry components, for the joint used in roofs, doors, windows and furniture.	K5
C109. 5	Develop sheet metal models, fitting models and do basic machining operations	K6

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C109. 1	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C109. 2	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C109. 3	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C109. 4	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C109. 5	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C109	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

I CIVIL ENGINEERING PRACTICE 12

Buildings:

a) Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects.

Plumbing Works:

a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers and elbows in household fittings.
b) Study of pipe connections requirements for pumps and turbines.
c) Preparation of plumbing line sketches for water supply and sewage works.
d) Hands-on-exercise:
   Basic pipe connections-Mixed pipe material connection-Pipe connections with different joining components
e) Demonstration of plumbing requirements of high-rise buildings

Carpentry using Power Tools only:

a) Study of the joints in roofs, doors, windows and furniture.
b) Hands-on-exercise:
   Wood work, joints by sawing, Planning and cutting.

II MECHANICAL ENGINEERING PRACTICE 18

Welding:

a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
b) Gas welding practice

Basic Machining:

a) Simple Turning and Taper turning
b) Drilling Practice

Sheet Metal Work:

a) Forming & Bending:
b) Model making – Trays and funnels.
c) Different type of joints.

Machine assembly practice:

a) Study of centrifugal pump
b) Study of air conditioner

Demonstration on:

a) Smithy operations, upsetting, swaging, setting down and bending. Example –Exercise – Production of hexagonal headed bolt.
b) Foundry operations like mould preparation for gear and step cone pulley.
c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

Total: 30 Periods

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE **14**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.

2. Fluorescent lamp wiring.

3. Stair case wiring

4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.

5. Measurement of energy using single phase energy meter.

6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE **16**

1. Study of Electronic components and equipments – Resistor, colour coding

measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.

2. Study of logic gates AND, OR, EX-OR and NOT.

3. Generation of Clock Signal.

4. Soldering practice – Components Devices and Circuits – Using general purpose

PCB.

5. Measurement of ripple factor of HWR and FWR.

Total: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Chapman, W.A.J. Workshop Technology, Edward Arnold, 2001.

REFERENCES:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, DhanpathRai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2 Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT. and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008

`

II SEMESTER

`

SEMESTER II										
S. No.	**Course Code**	**Course Title**	**Category**	**CIE Marks**	**SEE Marks**	**Total marks**	**Credits**			
							L	**T**	**P**	**C**
THEORY										
1	21EN21T	Technical English	HSMC	40	60	100	3	0	0	3
2	21MA22T	Vector Calculus and ComplexIntegration	BSC	40	60	100	3	1	0	4
3	21PH23T	Engineering physics II	BSC	40	60	100	3	0	0	3
4	21EE24T	Basic Electrical, Electronics andInstrumentation Engineering	ESC	40	60	100	3	0	0	3
5	21CE25T	Construction Materials	PCC	40	60	100	3	0	0	3
6	21ME26T	Engineering Mechanics	ESC	40	60	100	3	1	0	4
7	21MC05T	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	MC	40	60	100	1	0	0	1
PRACTICAL										
8	21CE27P	Construction Materials laboratory	PCC	60	40	100	0	0	4	2
9	21CE28P	Computer Aided Building Drawing Laboratory	PCC	60	40	100	0	0	4	2
TOTAL										**25**

`

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21EN21T	Semester	II			
Category	HUMANITIES & SOCIAL SCIENCE INCLUDING MANAGEMENT COURSES (HSMC)		L	T	P	C
Course Title	TECHNICAL ENGLISH (COMMON FOR ALL BRANCHES)		3	0	0	3

COURSE OBJECTIVES:

- To make the students of engineering and technology to enhance their ability on reading and comprehencing the different texts
- To improve their creative and critical thinking so as to use in demanding contexts
- To equip the learners with the skills of writing convincing job Applications and effective reports
- To develop their speaking skills to make technical presentations and participate in group discussions
- To facilitate them to hone their soft skills

PREREQUISITE:

- Technical writing and basic English grammar.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C201. 1	***Read*** and understand general and technical texts	K2
C201. 2	***Apply*** creative and critical thinking and communicate their ideas efficiently	K2
C201. 3	***Participate*** in group discussions and deliver short speeches effectively	K3
C201. 4	***Write*** effectively and persuasively in academic and workplace contexts	K3
C201. 5	***Experiment with*** the future challenges confidently and successfully	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C201. 1	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 2	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 3	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 4	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 5	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

`

SYLLABUS **No. of Credits: 3**

UNIT-I TECHNICALWRITING AND VISUAL CONVERSION 9

PRACTICAL

LISTENING : Listening to pronunciation of longer words.

SPEAKING : Making out meaning of pictorial and graphical representations.

TUTORIAL

READING : Understanding logic and sequencing in reading inferring the exact meaning of text

WRITING : Extended Definition- Writing Instructions, Checklists & Recommendations- Reading short technical text from Journal.

VOCABULARY: Technical vocabulary- Regular and Irregular verbs.

UNIT- II TECHNICAL WRITING AND GUIDELINES PREPARATION 9

PRACTICAL

LISTENING : Comprehensive listening - Listening to telephonic conversations – short and long conversations from different domains, listening to various pre-recorded conversations and speeches.

SPEAKING : Delivering short speeches in the class.

TUTORIAL

READING : Technical reading on innovations and innovators.

WRITING : Conditional clauses, Numerical adjectives, Process Description

VOCABULARY: Collocation, Verbal Analogies.

UNIT-III TECHNICAL PROCESS WRITING 9

PRACTICAL

LISTENING : Listening to documentaries and making notes.

SPEAKING : Basic speaking practice based on BEC, IELTs, and TOFEL.

TUTORIAL

READING : longer text both general and technical –practice in speed reading

WRITING : Purpose statements, words are used as nouns and verbs- describing a process – use of sequence word - Interpretation of Graphs and Charts.

VOCABULARY: Sequence words –Misspelled words -Embedded sentences.

UNIT- IV TECHNICAL WRITING AND BUSINESS LETTERS 9

PRACTICAL

LISTENING : listening to native accents.

SPEAKING : Group Discussions - Process, Skills, Guidelines, Evaluation, Oral Presentation - Planning, Preparing, Organizing and Presenting.

TUTORIAL

READING : Reading for detailed comprehension.

WRITING : Cause and effect, impersonal passive voice, idioms and phrases, - Letter writing, job application, business correspondence (letters) – calling for quotations, placing order,complaint letters, preparing a memo, notice and e-mail itinerary.

VOCABULARY: clauses and If conditionals.

`

UNIT-V TECHNICAL WRITING AND REPORT WRITING 9

PRACTICAL

LISTENING : TED /ink talks

SPEAKING : Starting a Career — vision statement, preparing logo and tagline, making short term and long-term goals, setting plans.

TUTORIAL

READING : Reading and understanding technical articles.

WRITING : Degrees of comparison, editing, Email etiquette, Mispronounced words – Report writing survey, feasibility, industrial visit, reporting various incidents and accidents, Minutes of meeting.

VOCABULARY: Reported speech.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Department of English, Anna University, Chennai. Mindscapes: English for Technologists and Engineers. Orient Black Swan, Chennai.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai, 2011.

REFERENCE BOOKS:

1. Rizvi, M. Ashraf, “Effective Technical Communication”, Tata McGraw—Hill,2006.
2. Ibbotson, Mark, “Cambridge English for Engineering”, Cambridge University Reference Press, 2008
3. Richard Johnson-Sheehan, “Technical Communication Today”4th EditionBooks Longman Publishing Group, 2011.
4. Richard Johnson-Sheehan, “Technical Communication Today”4th EditionBooks Longman Publishing Group, 2011
5. Porter, Patricia A., and Margaret Grant, “Communicating Effectively in English: Ora1 Communication for Non-Native Speakers”, 2nd Edition, Wadsworth, 1992.
6. Gopalaswamy, Ramesh & Ramesh Mahadevan. ACE of Soft Skills: Attitude, Communication and Etiquette for Success, New Delhi: Pearson, 2010.

Extensive Reading:

Wells, H G. The Time Machine, Peacock, India, 2008.

`

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21MA22T	Semester	II			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	VECTOR CALCULUS AND COMPLEX INTEGRATION (COMMON FOR ALL BRANCHES)		3	1	0	4

COURSE OBJECTIVES:

- To improve their ability in vector calculus
- To expose to the ideas of analytic functions
- To solve differential equation using the concept of Laplace Transform.

PREREQUISITE:

- Mathematics skills at Sem-I level

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C202.1	***Apply*** the vector calculus concepts to solve engineering problems.	K3
C202.2	***Apply*** the concept of mapping to solve Linear equation.	K3
C202.3	***Apply*** the complex integration problem ideas to solve engineering problems.	K3
C202.4	***Understand*** the concepts of multiple integrals.	K2
C202.5	***Apply*** the concepts of Laplace transformation to solve Differential Equations.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C202.1	3	2	-	-	-	-	-	-	-	-	-	-
C202.2	3	2	-	-	-	-	-	-	-	-	-	-
C202.3	3	2	-	-	-	-	-	-	-	-	-	-
C202.4	2	2	-	-	-	-	-	-	-	-	-	-
C202.5	3	2	-	-	-	-	-	-	-	-	-	-
C202	3	2	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

`

SYLLABUS **No. of Credits: 4**

UNIT I VECTOR CALCULUS 12

Gradient, divergence, curl – Solenoidal and irrotational fields – Vector identities– Directional derivatives – Line, surface and volume integrals –Green's, Gauss divergence and Stoke's theorems (without proof) .

UNIT II ANALYTIC FUNCTIONS 12

Limit of a complex functions-Derivative of f(z)-Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions - Determination of harmonic conjugate – Milne-Thomson's method – Conformal mappings: 1/z, az , az+b and bilinear transformation.

UNIT III COMPLEX INTEGRATION 12

Line integral – Cauchy's integral theorem (statements only) – Cauchy's integral formulae and its applications – Taylor's and Laurent's expansions (statements only) – Singularities – Poles and Residues – Cauchy's residue theorem (statement only) – Contour integration – Unit circle and semicircular contour.

UNIT IV MULTIPLE INTEGRALS 12

Double integration in Cartesian and polar coordinates – Change of order of integration – Area as double integral – Triple integration in Cartesian coordinates – Conversion from Cartesian to polar Volume as a double and Triple Integral.

UNIT V LAPLACE TRANSFORMS 12

Definition-Conditions for existence- Transforms of elementary functions – Properties of Laplace Transform-Transforms of periodic functions – Transforms of derivatives and integrals– Inverse transforms – Convolution theorem– Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only- Unit step function and Unit impulse function [simple problems only]

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. B. S. Grewal, Higher **Engineering Mathematics**, Khanna Publishers, New Delhi, 42nd Edition, 2012.

REFERENCES:

1. E. Kreyszig, **Advanced Engineering Mathematics**, John Wiley & Sons. Singapore, 10thEdition, 2012.
2. M.K. Venkataraman, Engineering **Mathematics: Vol I and II**, National Publishing., Chennai 2001.
3. T. Veerarajan, **Engineering Mathematics**, Tata McGraw Hill Publishing Co, New Delhi, 2004.

`

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21PH23T	Semester	II			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	ENGINEERING PHYSICS II COMMON FOR (CSE, IT, ECE, CHEMICAL, CIVIL, AI&DS, CSE(AI&ML))		3	0	0	3

COURSE OBJECTIVES:

- To equip the students with the knowledge of carrier concentration and doping in semiconductors.
- To familiarize the basics of Magnetic and Superconducting materials.
- To empower the students in understanding the importance of fluid properties.
- To elucidate the physics and instrumentation of spectrometry

PREREQUISITE:

- High School Maths and Physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C203.1	***Understand*** basics of electronic states and energy band structure formation	K2
C203.2	***Understand*** the importance of carrier concentration and doping in semiconductors	K2
C203.3	***Understand*** physics of magnetic and superconducting materials.	K2
C203.4	***Understand the*** importance of fluid properties.	K2
C203.5	***Understand*** the physics of spectrometry and its instrumentation.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C203.1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.4	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

`

SYLLABUS **No. of Credits: 3**

UNIT I SOLID STATE ELECTRONICS 9

Band theory of solids - Classification of solids on the basis of band theory - Classical free electron theory - expression for electrical conductivity - thermal conductivity - Wiedemann-Franz law - electrons in metals - Fermi-Dirac probability function - Position of Fermi level Temperature variation of carrier concentration - density of energy states - electron effective mass - concept of hole.

UNIT II SEMICONDUCTING MATERIALS AND DEVICES 9

Elemental and compound semiconductors - Intrinsic and extrinsic semiconductors - Properties. Carrier concentration in intrinsic, n-type and p-type semiconductors. Hall effect - experimental determination of Hall coefficient. Application - Hall and Peltier devices - Formation of p-n junctions - position of Fermi level in equilibrium - forward and reverse bias - p-n junction diode: I-V characteristics in forward and reverse bias - Photodiode - LDR, LED, and solar cell.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Introduction to magnetic materials - Domain theory of ferromagnetism, Hysteresis. Soft and Hard magnetic materials - Anti-ferromagnetic materials - Ferrites, magneto resistance material Superconducting phenomena - properties of superconductors - Meissner effect and isotope effect. Type-I and Type-II superconductors, High TC superconductors - Magnetic levitation and SQUIDS.

UNIT IV FLUID MECHANICS 9

Introduction to ideal and real fluids- Basic concepts of density and pressure in a fluid- Newtonian fluids, Non-Newtonian fluids - Capillarity – Surface tension - Experimental determination of surface tension by capillary rise method – Viscosity - Coefficient of viscosity - Role of temperature on surface tension and viscosity - Measurement of pressure by strain-gauge diaphragms.

UNIT V SPECTROMETRY 9

Theory of Infrared absorption spectrometry – Quantum treatment– Instrumentation – Infrared sources and detectors. Applications – Theory of Raman spectroscopy – excitation mechanism. Instrumentation – Sources and detectors. Nuclear Magnetic Resonance – Relaxation process in NMR – Free induction decay – Chemical Shift – Instrumentation and components of NMR.

Total: 45 Periods

`

LEARNING RESOURCES:

TEXT BOOKS:

1. N.Garcia, A. Damask and S.Schwarz “Physics for Computer Science Students”, SpringerVerlag, 2012.
2. Umesh Mishra and Jasprit Singh, “Semiconductor Device Physics and Design”, Springer, 2008.
3. C. Kittel , Introduction to solid state physics, Wiley. 2004
4. Yunus a. Çengel, john m. Cimbala Fluid Mechanics: fundamentals and applications Fourth edition Mc Graw Hill 2018
5. Aruldas Molecular Structure and Spectroscopy Prentice Hall 2007.

REFERENCES:

1. Arthur Beiser Concepts of Modern Physics; Tata McGraw – Hill Edition. 2003
2. Steven H. Simon, The Oxford Solid State Basics 1st Edition Oxford 2013
3. S O Pillai, Solid State Physics, New Age International 2006
4. Willard H H, Meritt L L Dean J A and Settle F A, “Instrumental Methods of Analysis”, CBS Publishers and Distributions, New Delhi, 2001.
5. C.N.Banwell Fundamentals of Molecular Spectroscopy , Fourth edition Tata Mc.Graw Hill
6. Bruce R. Munson, Alric P. Rothmayer, Theodore H. Okiishi, Wade W. Huebsch Fundamentals of fluid mechanics Wiley, 2012

`

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21EE24T	Semester	II			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	BASIC ELECTRICAL, ELECRONICS AND INSTRUMENTATION ENGINEERING COMMON FOR (CSE, IT, AI&DS, BIOTECH, CIVIL, MECH, CSE(AI&ML))		3	0	0	3

COURSE OBJECTIVES:

- The course is intended to introduce the students to basic theorems and laws in DC and AC circuits.
- This course aims at giving adequate exposure to students on the principles of electrical machines.
- The course will enable the students to acquire knowledge on fundamentals and applications of various electronic devices and measuring instruments.

PREREQUISITE:

- Engineering Physics, Mathematics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C204.1	***Impart*** knowledge on electrical circuit components, laws and theorems.	K2
C204.2	***Analyze*** the behavior of ac circuits components in power system	K3
C204.3	***Illustrate*** the working of various ac machines, dc machines and special machines along with its characteristics.	K2
C204.4	***Infer*** and ***relate*** the working and applications of various electronics devices and circuits.	K2
C204.5	***Categorize*** the specific instruments for electrical measurements.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C204.1	3	2	-	-	-	-	-	-	2	-	1	1
C204.2	3	2	-	-	-	-	-	-	2	-	1	1
C204.3	3	2	-	-	-	-	-	-	2	-	1	1
C204.4	3	2	-	-	-	-	-	-	-	-	1	1
C204.5	3	2	-	-	-	-	-	-	2	-	1	1
C204	3	2	-	-	-	-	-	-	2	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

`

SYLLABUS **No. of Credits: 3**

UNIT I DC CIRCUITS 9

Basic circuit components (R, L & C) - Ohms Law - Kirchoff's Law – voltage and current division -source transformation-steady state solution of DC circuits - Nodal analysis, Mesh analysis-Thevenin's Theorem, Norton's Theorem, Maximum Power transfer -Superposition Theorem.

UNIT II AC CIRCUITS 9

Introduction to AC circuits – waveforms and RMS value – power and power factor, Analysis of single-phase ac circuits consisting of RL and RLC combinations -Resonance- Balanced and Unbalanced three-phase circuits-Star and Delta connections.

UNIT III ELECTRICAL MACHINES 9

Principles of operation and characteristics of DC machines, Construction and operation of Single-Phase transformer – Three phase transformer connections – Autotransformer. Construction and types of Single phase and Three phase Induction motor, Construction and working principle of Alternator, Stepper motors – Brushless DC Motors.

UNIT IV ELECTRONIC DEVICES & CIRCUITS 9

Types of Materials – Silicon & Germanium - PN Junction diodes – Structure, Operation and Characteristics – Display devices-LED, Laser diodes – Zener diode - Bipolar Junction Transistor-Characteristics and applications –Amplifiers - Basics, types and applications, Oscillators-Basics, types and its applications—D/A and A/D converters.

UNIT V MEASUREMENTS & INSTRUMENTATION 9

Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive Thermoelectric, piezoelectric, photoelectric, Hall effect. Types and principle of indicating Instruments – Multimeters, Wattmeter, instrument transformers (CT and PT), Oscilloscopes.

TOTAL: 45 PERIODS

LEARNING RESOURCES:

TEXT BOOKS:

1. D P Kothari and I.J Nagarath, ―Basic Electrical and Electronics Engineering, McGraw Hill Education (India) Private Limited, Third Reprint ,2016
2. Leonard S Bobrow, "Foundations of Electrical Engineering", Oxford University Press, 2013
3. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2007.

REFERENCES:

1. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2007
2. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006
3. N K De, Dipu Sarkar, "Basic Electrical Engineering", Universities Press (India)Private Limited 2016
4. David A. Bell, "Electronic devices and circuits", Oxford University higher education,5th edition2008.
5. Allan S Moris, "Measurement and Instrumentation Principles", Elseveir, First Indian Edition, 2006.

`

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE25T	Semester	II			
Category	PROFESSIONAL CORE COURSES (PCC)		L	T	P	C
Course Title	CONSTRUCTION MATERIALS		3	0	0	3

COURSE OBJECTIVES:

- Upon completion of this course, the student will be able
- To introduce students to various materials commonly used in civil engineering construction and their properties.
- To know the various types of concrete and their manufacturing process.
- Able to gain knowledge in modern materials to be used.

PREREQUISITE:

- Knowledge on Basic Construction Material ideas and engineering science & maths.

COURSE OUTCOMES:

CO. No.	Course Outcome	Blooms level
On successful completion of this Course, students will be able to		
C205. 1	***Understand*** the various conventional construction materials, properties and their uses	K2
C205. 2	***Understand*** the various construction materials like lime, cement and aggregates.	K2
C205. 3	***Learn*** the various types of concrete and their manufacturing process as well as the types of admixtures.	K2
C205. 4	***Understand*** the various use of timbers and other market forms of materials.	K2
C205. 5	***Illustrate*** the various techniques which are useful for the design of acoustical design of building sound insulation	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C205. 1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C205. 2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C205. 3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C205. 4	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C205. 5	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C205	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

`

SYLLABUS **No. of Credits: 3**

UNIT-I STONES – BRICKS – CONCRETE BLOCKS 8

Stone as building materials-Criteria for selection –Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification– Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Concrete blocks – Lightweight concrete blocks. Recent developments in construction materials for Cladding, Waterproofing, Tiles, Paints, Formwork.

UNIT-II LIME – CEMENT – AGGREGATES – MORTAR 9

Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – fine aggregates – River sand – Crushed stone sand – Properties – Coarse Aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading.

UNIT-III CONCRETE 11

Manufacturing Process – Batching plants –Mixing – Transporting – Placing – Compaction of concrete –Curing and finishing – Ready mix Concrete – Mix specification- - High performance concrete - Self compacting concrete - Self curing concrete – Recycled aggregate concrete - Bacterial concrete - Nano Concrete - Mineral admixtures-Slags-Pozolanas and Fillers-Chemical admixtures-Solutes retarders-Air entraining agents-Waterproofing compounds-Plasticizers and Superplasticizers.

UNIT-IV TIMBER AND OTHER MATERIALS 8

Timber – Market forms – Industrial timber– Plywood – Veneer – Thermocol – Panels of laminates– Steel – Aluminum and Other Metallic Materials – Composition – Aluminium composite panel –Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumen’s

UNIT-V MODERN MATERIALS 9

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles - Epoxy resins and screeds for rehabilitation Fly ash and High volume fly ash concrete Principles of acoustical design of building Sound insulation materials- Silicon chips as fine aggregates (E-waste) -Born again concrete (Recycled aggregate concrete)

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
2. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, DhanpatRai and Sons, 19th edition 2000.

`

3. Varghese , P.C. Building construction, Prentice Hall of India Pvt. Ltd, New Delhi,2007.
4. Gambhir.M.L.,"ConcreteTechnology",3rdEdition,TataMcGrawHillEducation,2004.
5. Duggal.S.K.,"BuildingMaterials",4thEdition,NewAgeInternational,2008.

REFERENCES:

1. “Concrete Technology - Theory and Practice”M.S.Shetty,S.Chand,NewDelhi,1992.
2. “Jagadish.K.S,"Alternative Building Materials Technology", New Age International,2007.
3. Gambhir.M.L., & NehaJamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt.Ltd, New Delhi,2012.
4. IS383-1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011.
5. IS1542-1992: Indian standard specification for sand for plaster, 2009.
6. IS10262-2009: Indian Standard Concrete Mix Proportioning–Guidelines, 2009.

`

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21ME26T	Semester	II			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	ENGINEERING MECHANICS (COMMON FOR MECH, CIVIL)		3	1	0	4

COURSE OBJECTIVES:

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

PREREQUISITE:

- Engineering Physics, Mathematics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C206.1	***Illustrate*** the vectorial and scalar representation of forces and moments	K2
C206.2	***Analyze*** the rigid body in equilibrium	K4
C206.3	***Calculate*** dynamic forces exerted in rigid body	K4
C206.4	***Examine*** the friction and the effects by the laws of friction	K4
C206.5	***Evaluate*** the properties of surfaces and solids	K5

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C206.1	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
C206.2	3	3	2	1	-	1	-	-	-	-	-	1	-	2	-	-
C206.3	3	3	-	-	-	1	-	-	-	-	-	1	-	2	-	-
C206.4	3	3	-	-	-	1	-	-	-	-	-	1	-	2	-	-
C206.5	3	3	2	1	-	1	-	-	-	-	-	1	-	2	-	-
C206	3	3	2	1	-	1	-	-	-	-	-	1	-	2	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

`

SYLLABUS **No. of Credits: 4**

UNIT I STATICS OF PARTICLES 12

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces - additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports –Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem - Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions.

UNIT III PROPERTIES OF SURFACES AND SOLIDS 12

Centroids and centre of mass – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula – Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula –Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas –Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle- Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND RIGID BODY DYNAMICS 12

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL: 60 PERIODS

`

LEARNING RESOURCES:

TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi, 2004.
2. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 2007.

REFERENCES:

1. Vela Murali, "Engineering Mechanics", Oxford University Press, 2010.
2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., "Engineering Mechanics- Statics - Volume 1, Dynamics- Volume2", Third Edition, John Wiley & Sons,1993.
5. Rajasekaran S and Sankara subramanian G., "Engineering Mechanics Statics and Dynamics", 3rdEdition, Vikas Publishing House Pvt. Ltd., 2005.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21MC05T	Semester	II			
Category	MANDATORY COURSE (MC)		L	T	P	C
Course Title	*தமிழரும் தொழில்நுட்பமும்*		1	0	0	1

SYLLABUS: **No. of Credits: 1**

அலகு 1 நெசவு மற்றும் பானை தொழில்நுட்பம்: 3

சங்க காலத்தில் நெசவு தொழில் – பாண்டங்களின் கீறல் குறியீடுகள்

அலகு 2 வடிவமைப்பு மற்றும் கட்டிட தொழில்நுட்பம்: 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள். சோழர் காலக் கட்டிடக்கலை, மாமல்லபுரம் சிற்பங்களும், கோவில்களும்

அலகு 3 உற்பத்தி தொழில் நுட்பம்: 3

கப்பல் கட்டும் கலை – இரும்பு தொழிற்சாலை – இரும்பை உருக்குதல் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசன தொழில் நுட்பம்: 3

கடல் சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துகுளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு

அலகு 5 அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்: 3

தமிழின் வளர்ச்சி – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் மின் நூலகம்

Total: 15 Periods

`

அடிக்குறிப்பு

1) தமிழக வரலாறு – மக்களும் பண்பாடும் – கே . கே பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்

2) கணினி தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3) கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்

`

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21MC05T	Semester	II			
Category	MANDATORY COURSE (MC)		L	T	P	C
Course Title	TAMILS AND TECHNOLOGY (COMMON FOR ALL BRANCHES)		1	0	0	1

SYLLABUS **No. of Credits: 1**

UNIT 1 WEAVING AND CERAMIC TECHNOLOGY: **3**

Weaving Industry During Sangam Age - Graffiti on Potteries.

UNIT 2 DESIGN AND CONSTRUCTION TECHNOLOGY: **3**

Dravidian Architecture; Contemporary Architecture; Cholar kala kattida kalai, Pallava Architecture; Motifs; Temple Architecture.

UNIT 3 MANUFACTURING TECHNOLOGY: **3**

Metallurgical Studies- Iron Industry Steel; Beads Making Industry.

UNIT 4 AGRICULTURE AND IRRIGATION TECHNOLOGY: **3**

Agriculture in Ancient Tamil Era; Land Classification; Crops; Irrigation; Crop Rotation; Marketing; Agriculture in Tamil Literature.

UNIT 5 SCIENTIFIC TAMIL & TAMIL COMPUTING: **3**

Digitalization of Tamil Books

Total: 15 Periods

REFERENCES:

1) Historical Heritage of the Tamils (Dr. S. Subatamanian, Dr. K. D Thirunavukkarasu) (Published By: International of Tamil Studies)
2) The Contributions of Tamil to Indian Culture (Dr. M. Valarmathi) (Published By: International Institute of Tamil Studies.)
3) Keeladi - 'Sangam City Civilization on the Banks of River Vaigai' (Jointly Published By: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

`

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE27P	Semester	II			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	CONSTRUCTION MATERIALS LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- To facilitate the understanding of the Behaviour of construction materials.

PREREQUISITE:

- Knowledge on Basic Construction Material

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C208. 1	***Classify*** the aggregates based on the IS standards	K2
C208. 2	***Determine*** the strength on the aggregates	K3
C208. 3	***Determine*** the strength of the concrete	K3
C208. 4	***Carry out*** the slump cone test	K3
C208. 5	***Carry out*** the strength on bricks and tiles	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C208. 1	3	2	-	-	-	-	-	-	-	-	-	-
C208. 2	3	2	-	-	-	-	-	-	-	-	-	-
C208. 3	3	2	1	-	-	-	-	-	-	-	-	-
C208. 4	3	2	1	-	-	-	-	-	-	-	-	-
C208. 5	3	2	1	-	-	-	-	-	-	-	-	-
C208	3	2	1	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

`

SYLLABUS **No. of Credits: 3**

EXERCISES:

I. TEST ON FINE AGGREGATES **15**

1. Grading of fine aggregates
2. Test for specific gravity and test for bulk density
3. Compacted and loose bulk density of fine aggregate

II. TEST ON COARSE AGGREGATE **15**

1. Determination of impact value of coarse aggregate
2. Determination of elongation index
3. Determination of flakiness index
4. Determination of aggregate crushing value of coarse aggregate

III. TEST ON CONCRETE **15**

1. Test for Slump
2. Test for Compaction factor
3. Test for Compressive strength - Cube & Cylinder
4. Test for Flexural strength

IV. TEST ON BRICKS AND BLOCKS **15**

1. Test for the shape and size of the bricks
2.Test for compressive strength of bricks and blocks 3.Test for Water absorption of bricks and blocks
4.Determination of Efflorescence of bricks
5.Test on tiles

TOTAL: 60 PERIODS

LEARNING RESOURCES:

TEXT BOOK:

1. Sheety.M.S., Concrete Technology (Theory and Practice), S Chand and company limited 2015.

REFERENCES:

1. Construction material Laboratory Instruction Manual, published by Engineering College Cooperative Society, Anna University, Chennai, 2010.
2. IS 4031 (Part 1)-1996 – Indian Standard Codes.
3. IS 4031 (Part 3 and Part 5) – 1988.
4. IS 2386 (Part 1 to Part 6) – 1963
5. IS 383– 2016 Indian Standard specification for coarse and fine aggregates from natural sources for concrete.

`

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE28P	Semester	II			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	COMPUTER AIDED BUILDING DRAWING LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functionalrequirements as per National Building Code.

PREREQUISITE:

- Knowledge on Engineering Graphics
- Knowledge on basics of Drawing
- Knowledge on Geometry and Trigonometry

COURSE OUTCOMES:

CO. No	Course Outcomes	Knowledge Level
On successful completion of this Course, students will be able to		
C209.1	***Achieve*** skill sets to prepare computer aided engineering drawings	K2
C209.2	***Use*** the Auto CAD commands for drawing 2D & 3D building drawings required for different civil Engineering applications	K2
C209.3	***Plan*** and draw Civil Engineering Buildings as per aspect and orientation	K2
C209.4	***Present*** drawings as per user requirements and preparation of technical report	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C209.1	2	1	-	-	3	-	-	-	-	-	-	-
C209.2	2	1	-	-	3	-	-	-	-	-	-	-
C209.3	2	1	-	-	3	-	-	-	-	-	-	-
C209.4	2	1	-	-	3	-	-	-	-	-	-	-
C209	2	1	-	-	3	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

`

SYLLABUS **No. of Credits: 2**

LIST OF EXPERIMENTS

1. Building bye-law and basics of Auto CAD.
2. Auto CAD – Basics
3. 2-D Figures Using Auto CAD
4. Isometric Drawings
5. 3-D Figures Using Auto CAD
6. Principles of Planning, Orientation and Complete Joinery Details of Paneled Doors
7. Principles of Planning, Orientation and Complete Joinery Details of Glazed Doors
8. Principles of Planning, Orientation and Complete Joinery Details of Windows
9. Plan of a Residential Building
10. Buildings With Load Bearing Walls
11. Buildings With Sloping Roof
12. R.C.C. Framed Structures.
13. Industrial buildings – North light roof structures
14. Computer Aided Building drawing for Dispensary (Plan, Elevation, Section)

LEARNING RESOURCES:

1. Sikka V.B., A Course in Civil Engineering Drawing, 4 th Edition, S.K.Kataria and Sons, 2015.
2. George Omura, Mastering in Auto CAD 2005 and Autocad LT 2005– BPB Publications, 2008.

REFERENCES:

1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, BIM Handbook: A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons. Inc.,2011.
2. Marimuthu V.M., Murugesan R. and Padmini S., Civil Engineering Drawing-I, Pratheeba Publishers, 2008.
3. Shah.M.G., Kale. C.M. and Patki.S.Y., Building Drawing with an Integrated Approach to Built Environment, Tata McGraw Hill Publishers Limited, 2007.
4. Verma.B.P., Civil Engineering Drawing and House Planning, Khanna Publishers, 2010.

TOTAL: 60 PERIODS

III SEMESTER

`

SEMESTER III										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21CE31T	Surveying Instruments and Measurements	PCC	40	60	100	3	0	0	3
2	21CE32T	Strength of Materials I	PCC	40	60	100	3	1	0	4
3	21CE33T	Fluid Mechanics	PCC	40	60	100	3	0	0	3
4	21MA34T	Series, Transforms and Partial Differential equations	BSC	40	60	100	3	1	0	4
5	21CE35T	Engineering Geology	PCC	40	60	100	3	0	0	3
6	21MC01T	Constitution of India	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21CE37P	Strength of Materials Laboratory	PCC	60	40	100	0	0	4	2
8	21CE38P	Surveying Laboratory	PCC	60	40	100	0	0	4	2
TOTAL										**21**

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE31T	Semester	III			
Category	PROFESSIONAL CORE COURSES (PCC)		L	T	P	C
Course Title	SURVEYING INSTRUMENTS AND MEASUREMENTS		3	0	0	3

COURSE OBJECTIVES:

Upon completion of this course, the student will be able to

- To develop skills using instruments including measuring tapes, compass and chains
- Impart knowledge on theodolite and tacheometic survey.
- Impart knowledge on control surveying by error calculations, weighed observation and adjustments.
- Knowledge on TS, EDM & GPS and to execute the advanced surveying methods.

PREREQUISITE:

- Knowledge on Basics of Engineering Science
- Knowledge on Basics of Trigonometry

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C301.1	***Understand*** the basics of linear and angular measurements using chain, tape and compass surveying	K2
C301.2	***Understand*** the various measurement methods using theodolite and tacheometric surveying.	K2
C301.3	***Explain*** the concepts of control surveying and their adjustments.	K2
C301.4	***Understand*** the concepts of land surveying using total station.	K2
C301.5	***Able to*** carry out the model surveying with advanced instruments.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C301.1	1	2	-	-	-	-	-	-	-	-	-	-
C301.2	3	3	-	-	-	-	-	-	-	-	-	-
C301.3	2	3	-	-	-	-	-	-	-	-	-	-
C301.4	2	2	-	-	-	-	-	-	-	-	-	-
C301.5	3	1	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I FUNDAMENTALS OF CONVENTIONAL SURVEYING AND LEVELLING 5

Classifications and basic principles of surveying – Chains – Tapes– Compass – Basic Principles – Bearing – Levelling – Principles and theory of Levelling – Datum- – Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling-Booking – Reduction – Sources of errors in Levelling – Curvature and refraction

UNIT II THEODOLITE AND TACHEOMETRIC SURVEYING 10

Horizontal and vertical angle measurements – Temporary and permanent adjustments – Heights and distances – Tacheometer – Stadia Constants – Analytic Lens -Tangential and Stadia Tacheometry surveying – Contour – Contouring – Characteristics of contours – Methods of contouring – Tacheometric contouring – Contour gradient – Uses of contour plan and map

UNIT III CONTROL SURVEYING AND ADJUSTMENT 9

Horizontal and vertical control – Methods – Specifications – Triangulation- Baseline – Satellite stations – Reduction to centre- Trigonometrical levelling – Single and reciprocal observations – Traversing – Gale's table. – Errors Sources- precautions and corrections – Classification of errors – True and most probable values – Weighed observations – Method of equal shifts –Principle of least squares – Normal equation – Correlates- Level nets- Adjustment of simple triangulation networks.

UNIT IV TOTAL STATION AND MEASUREMENTS 10

Basic units-Measurement of distance -Measurement of distance using TS -Measurement of horizontal angle using TS- Measurements of vertical angles and heights using TS - Mapping fundamentals – Laser alignment instrument – Electronic theodolite

UNIT V ADVANCED SURVEYING 11

Introduction to E D M – Electronic distance measurement (EDM) – Fundamentals and operations – Overview of land surveying – Introduction to GPS – GPS signal – Segments, Positioning methods, Errors, applications – Field data collection through remote sensing and photogrammetry – LIDAR survey – DRONE survey.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Kanetkar T.P., "Surveying and Levelling", Vols. I and II, United Book Corporation, Pune, 2010.
2. Punmia B.C.,"Surveying", Vols. I, II and III, Laxmi Publications, 16th Edition, 2005.
3. Burrough P.A. and Rachel A. McDonell, Principles of Geographical Information Systems, Oxford Publication, 2004.

REFERENCES:

1. Clark D., “Plane and Geodetic Surveying for Engineers”, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 2001.
2. James M.Anderson and Edward M.Mikhail., “Introduction to Surveying”, McGraw-Hill Book Company, 2005.
3. Heribert Kahmen and Wolfgang Faig, “Surveying”, Walter de Gruyter, 2006.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE32T	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	STRENGTH OF MATERIALS I		3	1	0	4

COURSE OBJECTIVES:

- To learn the fundamental concepts of Stress, Strain and deformation of solids.
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
- To understand the effect of torsion on shafts and springs.
- To analyze plane and space trusses

PREREQUISITE:

- Knowledge on Engineering Mechanics
- Knowledge on Mathematics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C302.1	***Understand*** concepts of stress and strain, principal stresses and principal planes.	K2
C302.2	***Determine*** Shear force and bending moment in beams and understand concept of theory of simple bending	K3
C302.3	***Calculate*** the deflection of beams by different methods	K3
C302.4	***Apply*** equation of torsion in design of circular shafts and helical springs,	K3
C302.5	***Analyze*** the pin jointed plane and space trusses	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C302.1	2	1	-	-	-	-	-	-	-	-	-	-
C302.2	2	1	-	-	-	-	-	-	-	-	-	-
C302.3	2	1	-	-	-	-	-	-	-	-	-	-
C302.4	2	1	-	-	-	-	-	-	-	-	-	-
C302.5	3	1	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 12

Simple Stresses and strains – Elastic constants - Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member - Composite Bars - Thermal Stresses – stresses due to impact load-Principal Stresses and Principal Planes – Maximum shear stress - Mohr's circle method.

UNIT II TRANSFER OF LOADS AND STRESSES IN BEAMS 12

Types of loads, supports, beams – concept of shearing force and bending moment - Relationship between intensity of load, Shear Force and Bending moment - Shear Force and Bending Moment Diagrams for Cantilever, simply supported and overhanging beams with concentrated load, uniformly distributed load, uniformly varying load and concentrated moment. Theory of Simple Bending – Stress Distribution due to bending moment and shearing force.

UNIT III DEFLECTION OF BEAMS 12

Elastic curve – Governing differential equation - Double integration method - Macaulay's method -Area moment method - conjugate beam method for computation of slope and deflection of determinant beams.

UNIT IV TORSION 12

Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Stepped shafts-Closed and Open Coiled helical springs – springs in series and parallel.

UNIT V ANALYSIS OF TRUSSES 12

Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient – Analysis of Space trusses by tension coefficient method.

TOTAL : 60 PERIODS

LEARNING RESOURCES:

TEXT BOOKS:

1. Rajput.1. Rajput.R.K. “Strength of Materials”, S.Chand and Co, New Delhi, 2015.
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS –I Strength of materials, Laxmi publications. New Delhi, 2015.
3. Rattan . S. S, “Strength of Materials”, Tata McGraw Hill Education Private Limited, New Delhi, 2012.
4. Bansal. R.K. “Strength of Materials”, Laxmi Publications Pvt. Ltd., New Delhi, 2010.

REFERENCES:

1. Timoshenko.S.B. and Gere.J.M, “Mechanics of Materials”, Van Nos Reinbhold, New Delhi 1999.
2. Vazirani.V.N and Ratwani.M.M, “Analysis of Structures”, Vol I Khanna Publishers, New Delhi,1995.
3. Junnarkar.S.B. and Shah.H.J, “Mechanics of Structures”, Vol I, Charotar Publishing House, New Delhi 2016.
4. Singh. D.K., “ Strength of Materials”, Ane Books Pvt. Ltd., New Delhi, 2016
5. Basavarajaiah, B.S. and Mahadevappa, P., Strength of Materials, Universities Press, Hyderabad, 2010.
6. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE33T	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	FLUID MECHANICS		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyze and appreciate the complexities involved in solving the fluid flow problems.

PREREQUISITE:

- Knowledge on Fluids and Flow Characteristics from physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C303.1	***Understand*** the basic properties of fluids, and the significance of basic principles of fluid statics.	K2
C303.2	***Explain*** the principles of kinematics with specific emphasis on application of continuity equation, stream function.	K2
C303.3	***Illustrate*** the fundamentals of dimensional analysis and application of Buckingham π -theorem in fluid flow problem.	K2
C303.4	***Apply*** fundamental concepts of fluid mechanics in solving fluid flow problems in pipes, design of pipe, and analysis of pipe networks.	K3
C303.5	***Compute*** the friction loss in laminar and turbulent flows.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C303.1	3	1	-	-	-	-	-	-	-	-	-	-
C303.2	2	2	1	-	-	-	-	-	-	-	-	-
C303.3	3	2	-	1	-	-	-	-	-	-	-	-
C303.4	3	-	-	-	1	-	-	-	-	-	-	-
C303.5	3	1	-	1	-	-	1	1	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I FLUID PROPERTIES AND FLUID STATICS 9

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - volume, density, specific weight, specific gravity, viscosity, compressibility, vapour pressure, - - pressure measurements by manometers-forces on planes – centre of pressure – buoyancy and floatation.

UNIT II FLUID KINEMATICS AND DYNAMICS 9

Fluid Kinematics – Classification and types of flow - velocity field and acceleration - continuity equation (one- and three-dimensional differential forms)- stream line-streak line-path line- stream function - velocity potential function - flow net. Fluid dynamics - equations of motion -Euler's equation along streamline - Bernoulli's equation – applications - Venturimeter, orifice meter and Pitot tube- linear momentum equation and its application to pipe bend.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi-theorem - dimensionless parameters - similitude's and model studies - distorted models.

UNIT IV FLOW THROUGH PIPES 9

Viscous flow -shear stress-pressure gradient relationship-laminar flow between parallel plates Reynolds's experiment - laminar flow through circular pipe (Hagen poiseulle's) - hydraulic and energy gradient – flow through pipes - Darcy - Weisbach's equation - pipe roughness -friction factor-Moody's diagram- major and minor losses of flow in pipes - pipes in series and in parallel.

UNIT V BOUNDARY LAYER 9

Boundary layer – definition- boundary layer on a flat plate – laminar and turbulent boundary layer-displacement, energy and momentum thickness – Momentum integral equation-Boundary layer separation and control – drag on flat plate.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Bansal.R.K. "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2013.
2. Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
3. Rajput.R.K. "Fluid Mechanics", S.Chand and Co, New Delhi, 2008.
4. Jain.A.K.., "Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
5. Subramanya.K "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.

REFERENCES:

1. Streeter, V.L., and Wylie, E.B., “Fluid Mechanics”, McGraw Hill, 2000.
2. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 2013.
3. White, F.M., “Fluid Mechanics”, Tata McGraw Hill, 5th Edition, New Delhi, 2017.
4. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2015.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21MA34T	Semester	III			
Category	BASIC SCIENCE COURSE(BSC)		L	T	P	C
CourseTitle	SERIES,TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (COMMON TO MECHANICAL, CIVIL, CHEMICAL)		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To develop Z transform techniques for discrete time systems.

PREREQUISITE:

- Mathematics skills at Sem-II level

COURSE OUTCOMES:

CO. No	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C304.1	***Understand*** how to solve the given standard partial differential equations.	K2
C304.2	***Solve*** differential equations using Fourier series analysis which plays a vital role in engineering applications.	K3
C304.3	***Appreciate*** the physical significance of Fourier series techniques in solving one- and two-dimensional heat flow problems and one-dimensional wave equations.	K2
C304.4	***Understand*** the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.	K2
C304.5	***Use*** the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1
C304.1	3	3	-	-	-	-	-	-	-	-	-	-
C304.2	3	2	-	-	-	-	-	-	-	-	-	-
C304.3	3	2	-	-	-	-	-	-	-	-	-	-
C304.4	3	2	-	-	-	-	-	-	-	-	-	-
C304.5	3	3	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Introduction-Formation of partial differential equations Solutions of a partial differential equation-Linear Equations of the first order– Non linear equations of the first order Charpit's method Linear partial Differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 12

Introduction - Euler's Formulae - Conditions for a Fourier Expansion-Functions having points of discontinuity-Change of interval – Odd and even functions–Half range sine series–Half range cosine series–Parseval's Formula-Complex form of Fourier series–Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Introduction - Method of separation of variables–Vibrations of a stretched string-Wave equation [Fourier Series Method Only]– One dimensional equation of heat conduction–Steady state solution of two-dimensional equation of heat conduction - Laplace's equation in polar coordinates.

UNIT IV FOURIER TRANSFORMS 12

Introduction-Statement of Fourier integral theorem–Fourier transforms – Properties of Fourier transforms–Convolution theorem–Parseval's identity for Fourier transform-Relation between Fourier and Laplace transforms.

UNIT V TRANSFORMS AND DIFFERENCE EQUATIONS 12

Introduction – Definition of Z-transforms – Some standard Z-transforms–Damping rule-Some standard results-Shifting to the right and left – Multiplication by n-Initial and Final value theorem – Inverse Z-transform (using partial fraction and residues) – Convolution theorem–Convergence of Z-transforms-Evaluation of inverse Z-transforms [using partial and residue method only]-Application of difference equations.

Total:60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES:

1. Erwin Kreyszig,"Advanced Engineering Mathematics ",10th Edition, John Wiley, India,2016.
2. B.V.Ramana, "Higher Engineering Mathematics", McGrawHill Education Pvt. Ltd, New Delhi, 2016.
3. Wylie,R.C.and Barrett,L.C.,"Advanced Engineering Mathematics",Tata McGraw Hill Education Pvt. Ltd, 6th Edition, NewDelhi, 2012.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE35T	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	ENGINEERING GEOLOGY		3	0	0	3

COURSE OBJECTIVES:

- This course will familiarize the students on the role and importance of geology in civil engineering, apart from learning the methods of surface and subsurface investigations using geological, geophysical and remote sensing methods.

PREREQUISITE:

- Knowledge on Basic Geography

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C305. 1	***Understand*** the internal structure of earth and its relation to earthquake,volcanism and the various geological agents.	K2
C305. 2	***Have*** better understanding of the role of minerals in engineering properties of construction materials and foundation rocks. Will also realize the importance of rocks as construction materials, foundation and road aggregates.	K2
C305. 3	***Appreciate*** the role of geological structures in the design and construction of major civil engineering projects such as dams, tunnels, bridges, roads, airport and harbours.	K2
C305. 4	***Gain knowledge*** on the role of geological mapping, remote sensing and geophysics for surface and subsurface investigations. In addition, the student will also gain knowledge on bore hole logging methods and their applications.	K2
C305. 5	***Use*** all the geological knowledge in design and construction of major civil engineering structures, in addition to mitigating geological hazards such as earthquakes, landslides and Tsunami that affect civil engineering structures.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C305. 1	2	-	-	-	-	-	-	-	-	-	-	-
C305. 2	2	-	-	-	-	-	-	-	-	-	-	-
C305. 3	2	-	-	-	-	-	-	-	-	-	-	-
C305. 4	2	2	-	-	-	-	-	-	-	-	-	-
C305. 5	2	2	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION 7

Significance of Geology in Civil Engineering - Internal structure of the Earth - soils - weathering (process and grades) - landforms and processes associated with river, wind, groundwater and sea – relevance to civil engineering.

UNIT II ENGINEERING PROPERTIES OF ROCKS AND MINERALS 10

Physical and Chemical properties of minerals – Properties of Quartz, Feldspar, Mica, Olivine, Pyroxene, Amphibole – Reactivity of alkaline minerals with cement and sand. Origin, texture, structure and petrography of: Hard rocks – Igneous and Metamorphic (Granite, Basalt, Dolerite, Gneiss, Quartzite, Schist, Slate, Marble); Soft rocks – Sedimentary (Sandstone, Limestone, Shale/clay).

UNIT III DISTRIBUTION, USES AND STRUCTURAL FEATURES OF ROCKS 8

Distribution and Uses of Rocks - Attitude of rocks – Dip, Strike measurement of attitude and thickness of rock beds – Relevance to civil engineering – Overview of folds, fractures, faults, joints in rocks – Relevance to civil engineering.

UNIT IV SURFACE AND SUB-SURFACE INVESTIGATIONS 11

Reconnaissance surface investigation – Geological mapping; remote sensing and field surveys for geological mapping – Overview of Geophysical methods - Electrical, Seismic, GPR. Applications for sub-surface investigation and groundwater exploration – Borehole core logging and interpretation to characterize weathering grade, strength, colour, hydro- properties, RMR, RQD, GSI and Q parameters

UNIT V GEOHAZARDS AND GEOLOGICAL CONSIDERATIONS FOR ENGINEERING STRUCTURES 9

Earthquake – Seismic zones of India - Landslides – causes and mitigation - Tsunami – causes and mitigation. Case studies from India. Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels and Road cuttings - Coastal protection.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Varghese, P.C., Engineering Geology for Civil Engineering Prentice Hall of India Learning Private Limited, New Delhi, 2012.
2. Parbin Singh. A "Text book of Engineering and General Geology", Katson publishing house, Ludhiana 2009.

REFERENCES:

1. Bell .F.G.. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.
2. Venkat Reddy. D. Engineering Geology, Vikas Publishing House Pvt. Lt, 2010.
3. Gokhale KVGK, "Principles of Engineering Geology", B.S. Publications, Hyderabad 2011.
4. Chenna Kesavulu N. "Textbook of Engineering Geology", Macmillan India Ltd., 2009.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21MC01T	Semester	III			
Category	MANDATORY COURSE (MC)		L	T	P	C
Course Title	CONSTITUTION OF INDIA (COMMON FOR ALL BRANCHES)		2	0	0	0

COURSE OBJECTIVES:

- To understand the importance of constitution.
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court, controller and auditor general of India and election commission of India.

PREREQUISITE:

- Civic Knowledge.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C306.1	***Understand*** historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administration	K2
C306.2	***Understand*** the directive principle of state policy, and strengthening of the constitutional institutions.	K2
C306.3	***Analyze*** the role of Governor and Chief Minister, role of state election commission, the decentralization of powers.	K2
C306.4	***Understand*** the Public Election Process.	K2
C306.5	***Know*** the Special Provisions for Various category of People.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C306.1	-	-	-	-	-	3	-	2	-	-	-	1	-	-	-
C306.2	-	-	-	-	-	2	-	2	-	-	-	1	-	-	-
C306.3	-	-	-	-	-	2	-	2	-	-	-	1	-	-	-
C306.4	-	-	-	-	-	1	-	2	-	-	-	1	-	-	-
C306.5	-	-	-	-	-	1	-	2	-	-	-	1	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 0**

UNIT I INTRODUCTION TO INDIAN CONSTITUTION 6

The Necessity of the Constitution, The Societies before and after the Constitution adoption. **Introduction to the Indian constitution,** The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India.

UNIT II FUNDAMENTAL RIGHTS AND DIRECTIVE PRINCIPLES 6

Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building. Directive Principles of State Policy (Art. 36-51).

UNIT III UNION EXECUTIVE AND STATE EXECUTIVE 6

Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Parliamentary Terminologies**.** Supreme Court of India, State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts.

UNIT IV ELECTIONS, AMENDMENTS AND EMERGENCY PROVISIONS 6

Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments Important Constitutional Amendments. Emergency Provisions, types of Emergencies and its consequences.

UNIT V DIRECTIVE PRINCIPLES & FUNDAMENTAL DUTIES 6

Fundamental Duties (Art. 51A), Basic Features of Constitution & Constitutional **special provisions:** Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.

Total: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. N. Shukla, Constitution of India, Eastern Book Agency, 2014.
2. P. Jain, Indian Constitutional Law, Lexis Nexis, 2013.
3. M. Seervai, Constitutional Law of India, Universal Law Publishing Co., Reprint 2013.

REFERENCES:

1. Glanville Austin, Indian Constitution – cornerstone of the Nations, Oxford University Press, 1999.
2. M. Bakshi, The Constitution of India, Universal Law Publishing Co., 2014.
3. D. Basu, Shorter Constitution of India (14^{th} Ed. 2008, reprint 2010).

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE37P	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	STRENGTH OF MATERIALS LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- The students will have the required knowledge in the area of testing of materials and Components of structural elements experimentally.

PREREQUISITE:

- Knowledge on Engineering Mechanics
- Knowledge on Mathematics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C307.1	***Identify*** the hardness test on metals	K3
C307.2	***Apply*** the impact test on metals	K3
C307.3	***Apply*** the deflection test on beam and spring.	K3
C307.4	***Compute*** the torsion test on mild steel	K4
C307.5	***Experiment with*** compression, tension and shear	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C307.1	3	2	-	-	-	-	-	-	-	-	-	-
C307.2	3	2	-	-	-	-	-	-	-	-	-	-
C307.3	3	2	-	-	-	-	-	-	-	-	-	-
C307.4	3	2	1	-	-	-	-	-	-	-	-	-
C307.5	3	2	1	-	2	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 2**

LIST OF EXPERIMENTS

1. Hardness test on metals (Rockwell Tests)
2. Hardness test on metals (Brinell Hardness Tests)
3. Impact test on metal specimen (Izod)
4. Impact test on metal specimen (Charpy)
5. Deflection test on beam
6. Torsion test on mild steel rod
7. Tension test on steel rod
8. Compression test on Helical Spring
9. Tension test on Helical Spring
10. Compression test on Cube
11. Compression test on Brick
12. Double shear Test on metals
13. Young's modulus of concrete

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.
2. IS1786-2008 (Fourth Revision, Reaffirmed 2013), 'High strength deformed bars and wires for concrete reinforcement – Specification', 2008.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE38P	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	SURVEYING LABORATORY		0	0	4	2

COURSE OBJECTIVE:

- At the end of the course the student will posses knowledge about Survey field techniques.

PREREQUISITE:

- Knowledge on Basics of Engineering Science
- Knowledge on Basics of Trigonometry

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C308. 1	***Understand*** the basics of linear and angular measurements using chain and compass surveying	K2
C308. 2	***Compare*** the various method of plotting the traverse using plain table surveying and theodolite surveying	K2
C308. 3	***Solve*** the heights and distances using tacheometry surveying.	K2
C308. 4	***Interpret*** the basic concept of total station	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C308. 1	2	1	-	-	-	-	-	-	-	-	-	-
C308. 2	2	2	-	-	-	-	-	-	-	-	-	-
C308. 3	2	2	-	-	-	-	-	-	-	-	-	-
C308. 4	2	2	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 2**

LIST OF EXPERIMENTS:

Levelling - Study of levels and levelling staff

1. Fly levelling using Dumpy level

Theodolite - Study of Theodolite

2. Measurements of horizontal angles by reiteration and repetition and measurement of vertical angles

3. Determination of elevation of an object using single plane method when base is accessible inaccessible.

Tacheometry – Tangential system – Stadia system

4. Determination of Tacheometric Constants

5. Heights and distances by stadia Tacheometry

6. Heights and distances by Tangential Tacheometry

Curve Setting

7. Setting out simple curve by Offsets from Long Chord Method

Total Station - Study of Total Station, Measuring Horizontal and vertical angles

8. Determination of area using total station

9. Traversing using Total station

10. Determination of Remote height using total station

11. Stake out using total station

12. Setting out curve using total station

13. Distance, gradient and difference of height between two inaccessible points using total station.

GPS SURVEYING- Study of hand-held GPS

14. Measurement of latitude, longitude and altitude using hand held GPS

15. Selection and marking of routes using hand held GPS

Total: 60 Periods

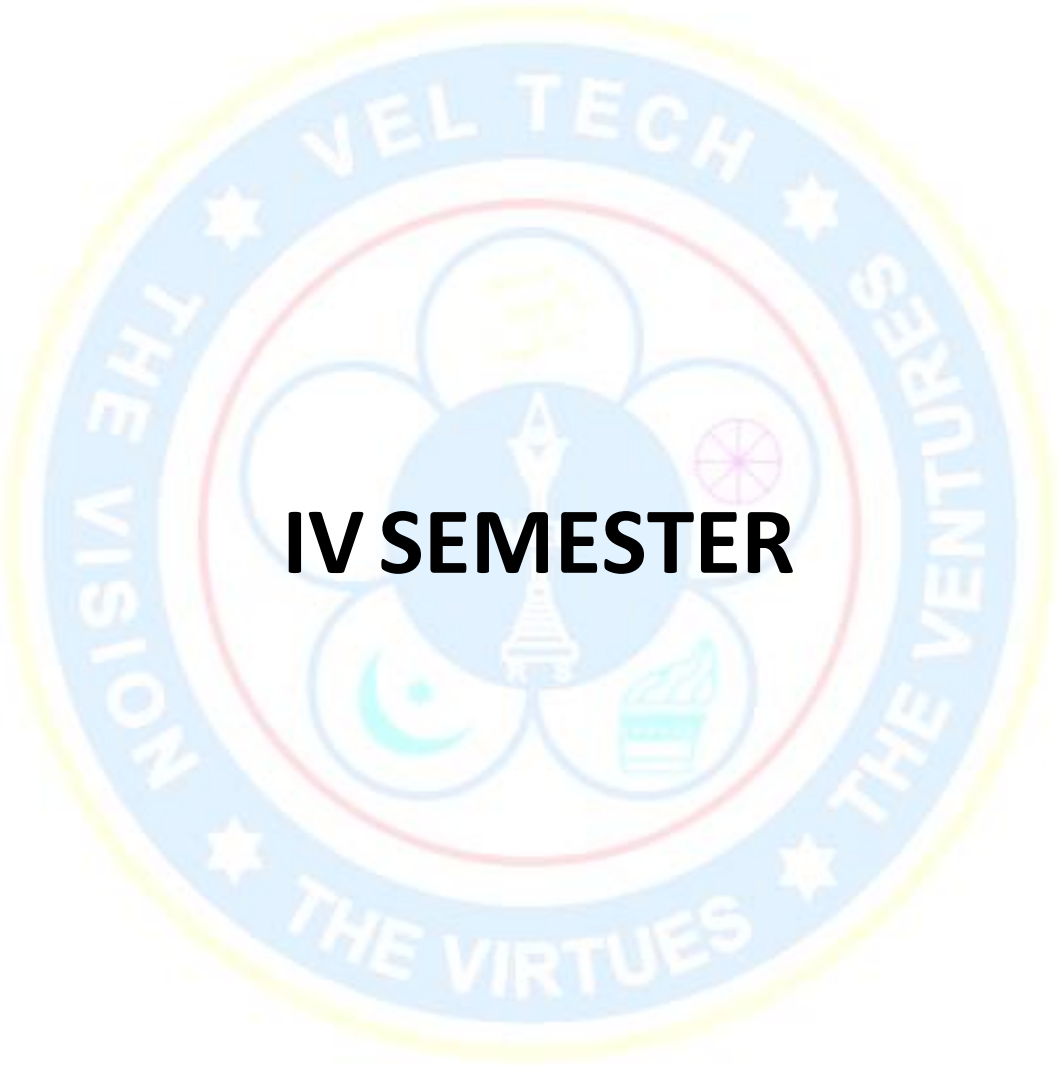
LEARNING RESOURCES:

TEXT BOOKS:

1. Punmia,B.C, Ashok K Jain and Arun K Jain, " Surveying" Vol. I&II, Laxmi Publication, 16th Edition, New Delhi, 2005.
2. Kanetkar T.P., "Surveying and Levelling", Vols. I and II, United Book Corporation, Pune, 2010.

REFERENCES:

1. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, 7th Edition, McGraw Hill, 2001.
2. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2004.
3. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice‟ Hall of India, 2004.
4. Arora K.R., Surveying Vol I & II, Standard Book house , 10th Edition 2008.



IV SEMESTER

SEMESTER IV										
S. No.	**Course Code**	**Course Title**	**Category**	**CIE Marks**	**SEE Marks**	**Total marks**	**Credits**			
							L	**T**	**P**	**C**
THEORY										
1	21CE41T	Concrete Technology	PCC	40	60	100	3	0	0	3
2	21CE42T	Strength of Materials II	PCC	40	60	100	3	1	0	4
3	21CE43T	Applied Hydraulics Engineering	PCC	40	60	100	3	0	0	3
4	21MA44T	Numerical Methods	BSC	40	60	100	3	1	0	4
5	21CE45IT	Basics of Applied Soil Mechanics	PCC	50	50	100	2	0	4	4
6	21MC02T	Environmental Sciences	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21CE47P	Hydraulic Engineering Laboratory	PCC	60	40	100	0	0	4	2
8	21EE01P	Mini Project – I	EEC	60	40	100	0	0	2	1
TOTAL										**21**

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE41T	Semester	IV			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	CONCRETE TECHNOLOGY		3	0	0	3

COURSE OBJECTIVES:

- Identify the construction materials and quality of concrete by various testing methods and concrete mix design.
- To know the various types of special concretes and their properties.

PREREQUISITE:

- Construction Materials
- Construction Materials Laboratory.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C401.1	***Explain*** the quality of construction materials by various testing methods as per standards.	K2
C401.2	***Understand*** the different types of mineral and chemical admixtures and its effects on concrete.	K2
C401.3	***Develop*** the concrete mix using ACI and BIS code methods	K3
C401.4	***Determine*** the various durability and Strength properties of concrete	K3
C401.5	***Select*** the suitable type of special concrete for real time situations	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C401.1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C401.2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C401.3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C401.4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C401.5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I CONSTITUENT MATERIALS **9**

ASTM classification of Cement - Micro structure of hydrated cement- Special cements- Properties of Special cement – Recycled Aggregates- Properties of Recycled aggregates-Methods of combining aggregates - Use of Sea Water for mixing of concrete- - Rheology of Concrete

UNIT II CHEMICAL AND MINERAL ADMIXTURES **9**

Accelerators – Retarders - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Effects on concrete properties- Statistical and quality control of concrete.

UNIT III PROPORTIONING OF CONCRETE MIX **9**

Design Mix and Nominal Mix - BIS Method of Mix Design - Mix Design Examples- Concrete mix design as per ACI method - The methods of curing of concrete as per ACI method- Modulus of elasticity of Concrete- Stress and Strain Characteristics of Concrete.

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE **9**

Pore Structure of Concrete- Rapid Chloride Penetration test- Resistance against Sulphate attack- Alkali aggregate reactivity- Segregation and Bleeding - Stress-strain curve for concrete – durability of concrete – water absorption – permeability – corrosion water resistant test –RPT - acid resistance and Fire resistance of concrete

UNIT V SPECIAL CONCRETES **9**

Light weight concretes - self compacting concrete – vacuum concrete - High strength concrete - Fibre reinforced concrete – Ferro cement - Ready mix concrete – SIFCON - Shotcrete – Polymer concrete - High performance concrete - Hot and Cold weathering Concrete- Green concrete.

Total: 45 Periods

LEARNING RESOURCES:

TEXTBOOKS:

1. Gupta. B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2018.
2. Shetty, M.S, "Concrete Technology", S. Chand and Company Ltd, New Delhi, 2018
3. Bhavikatti. S.S, " Concrete Technology", I.K. International Publishing House Pvt. Ltd., New Delhi, 2019
4. Santhakumar. A.R., "Concrete Technology", Oxford University Press India, 2018.

REFERENCES:

1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 2010
2. Gambhir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2017
3. IS10262-2009 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 2019.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE42T	Semester	IV			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	STRENGTH OF MATERIALS II		3	1	0	4

COURSE OBJECTIVES:

- To know the method of finding deflection of beams and to know the concept of analyzing indeterminate beams.
- To estimate the load carrying capacity of columns, determine stresses due to unsymmetrical bending and various theories for failure of material.

PREREQUISITE:

- Basics of Strength of materials I
- Basics of Engineering Mechanics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C402.1	***Apply*** the energy theorems and to compute the deflections in determinate beams, plane frames and plane trusses.	K3
C402.2	***Solve*** the continuous, propped cantilever & fixed beams.	K3
C402.3	***Analyse*** the stresses in columns for various end conditions and to solve the spherical shells, thick and thin cylinders.	K4
C402.4	***List*** the theories of failure and explain principal stresses and principal planes.	K4
C402.5	***Examine*** the stresses due to unsymmetrical bending of beams	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C402.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C402.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C402.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C402.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C402.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I ENERGY PRINCIPLES **9+3**

Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact loadings), shear, flexure and torsion – Castigliano's theorems–Maxwell's reciprocal theorem – Principle of virtual work – unit load method-Application of energy theorems for computing deflections in determinate beams , plane frames and plane trusses – lack of fit and temperature effects –Williot Mohr's Diagram

UNIT II INDETERMINATE BEAMS **9+3**

Concept of Analysis - Propped cantilever and fixed beams - fixed end moments and reactions – sinking and rotation of supports - Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT III COLUMNS AND CYLINDERS **9+3**

Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations – Rankine – Gordon formula – Eccentrically loaded columns – Columns with initial curvature (axial loading) - middle third rule - core of a section – Thin cylindrical and spherical shells– stresses and change in dimensions – Thick cylinders– Compound cylinders– shrinking on stresses.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS **9+3**

Stress tensor at a point - Stress invariants - Determination of principal stresses and principal planes -Volumetric strain. Theories of failure: Maximum Principal stress theory – Maximum Principal Strain theory – Maximum shear stress theory – Total Strain energy theory – Maximum distortion energy theory– Application problems.

UNIT V ADVANCED TOPICS **9+3**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre – curved beams– Winkler Bach formula – stresses in hooks

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S. Chand & company Ltd., New Delhi, 2018.
2. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures" (SMTS) Vol-II, Laxmi Publishing Pvt Ltd, New Delhi 2017.
3. Rattan.S.S., "Strength of Materials",Tata McGraw Hill Education Pvt.Ltd., New Delhi, 2016.
4. Basava rajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016.

REFERENCES:

1. Kazimi S. M.A, “Solid Mechanics”, Tata McGraw-Hill Publishing Co., New Delhi, 2017.
2. William A. Nash, “Theory and Problems of Strength of Materials”, Schaum’s Outline Series, Tata McGraw Hill Publishing company, 2013.
3. Singh. D.K., “Strength of Materials”, Ane Books Pvt. Ltd., New Delhi, 2020.
4. Egor P Popov, “Engineering Mechanics of Solids”, 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE43T	Semester	IV			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	APPLIED HYDRAULIC ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines.
- Student should be able to relate the theory and practice of problems in hydraulic engineering.

PREREQUISITE:

- Knowledge on flow characteristics from physics and Basics of fluid mechanics.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C403.1	***Knowledge*** on addressing problems of open channels.	K2
C403.2	***Identify*** an effective section for flow in different cross sections.	K3
C403.3	***Solve*** problems in rapidly varied flows in steady state conditions.	K3
C403.4	***Apply*** the principles, working and application of turbines	K3
C403.5	***Apply*** the principles, working and application of pumps.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C403.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C403.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C403.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C403.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C403.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I OPEN CHANNEL FLOW **9**

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow – Wide open channel - Specific energy and specific force – Critical flow - Measurement of flow in irregular channels.

UNIT II GRADUALLY VARIED FLOW **9**

Dynamic equations of gradually varied flows – Types of flow profiles - Classifications: Computation by Direct step method and Standard step method – Control section – Break in Grade – Computation - Effect on Discharge due to error in head measurement.

UNIT III RAPIDLY VARIED FLOW **9**

Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation – Celerity – Rapidly varied unsteady flows (positive and negative surges).

UNIT IV TURBINES **9**

Impact of Jet on flat, curved plates, Stationary and Moving –Classification of Turbines – Pelton wheel – Francis turbine – Kaplan turbine - Construction and working - Specific speed – Characteristic Curves of Turbines Draft tube and cavitations - Selection of turbines.

UNIT V PUMPS **9**

Classification of Pumps - Centrifugal pumps – Work done - Minimum speed to start the pump - NPSH - Multistage pumps – Characteristics curve - Reciprocating pumps - Negative slip - Indicator diagrams and its variations – Air vessels - Savings in work done.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Bansal .R.K., “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications 2019.
2. Subramanya. K,"Flow in open channels", Tata McGraw Hill, New Delhi, 2019.
3. Modi P.N and Seth. S.M "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2019.
4. Chandramouli P.N., “Applied Hydraulic Engineering”, Yes Dee Publishing Pvt. Ltd., 2017.

REFERENCES:

1. VenTe Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Hanif Chaudhry. M., "Open Channel Flow", Second Edition, Springer, 2007.
3. Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2008.
4. Jain.A.K., " Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21MA44T	Semester	IV			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	NUMERICAL METHODS (COMMON TO CSE, CHEMICAL AND CIVIL)		3	1	0	4

COURSE OBJECTIVES:

- To provide the necessary basic concepts of a few numerical methods.
- To provide procedures for solving numerically different kinds of problems
- occurring in the field of Engineering and Technology.
- To acquaint the knowledge of various techniques and methods of solving ordinary
- differential equations.

PREREQUISITE:

- Basic knowledge of ordinary differential equations.
- Multivariable calculus.

COURSE OUTCOME:

CO No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C404.1	***Solve*** algebraic equations that arise during the study of Engineering problems	K3
C404.2	***Use*** various interpolation techniques for solving problems in Engineering.	K3
C404.3	***Apply*** the numerical techniques of differentiation and integration for engineering problems.	K3
C404.4	***Solve*** initial value problems numerically that arise in Science and Engineering.	K3
C404.5	***Solve*** boundary value problems that encounter in different fields of Engineering study	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C404.1	2	1	1	1	-	-	-	-	-	-	-	-	-	-
C404.2	2	1	-	1	-	-	-	-	-	-	-	-	-	-
C404.3	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C404.4	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C404.5	2	1	-	-	-	-	-	-	-	-	-	-	-	-

Note: - 1: Slight 2: Moderate 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations – Fixed point iteration method – Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Pivoting – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT II INTERPOLATION AND APPROXIMATION 9+3

Interpolation with unequal intervals – Lagrange's interpolation – Inverse interpolation using Lagrange's method-Newton's divided difference interpolation –Interpolation with equal intervals – Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule and Simpson's 3/8 rule– Romberg's Method – Two point and three point Gausian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3

Taylor's series method - Picard's - Euler's method - Modified Euler's method -Runge - Kutta method - Milne's and Adams-Bashforth predictor corrector methods for solving first order equations

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3

Finite difference methods for solving second order two – point linear boundary value problems – Finite difference techniques for the solution of two dimensional Laplace's and Poison's equations on rectangular domain – One dimensional heat flow equation – Bender - Schmidt recurrence relation - Crank - Nicolson method – One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

LEARNING RESOURCES:

TEXT BOOKS:

1. Numerical methods with C++ programming by Nita H. Shah, PHI. 2009.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers,10th Edition, New Delhi,2015.
3. Burden, R. Land Faires, J.D," Numerical Analysis",9thEdition, Cengage Learning,2016.

REFERENCES:

1. Numerical methods for engineers and scientists by Joe D. Hoffman. Marcel Dekker, Inc. 2001.
2. Numerical methods with programs in C by T. Veerarajan and T. Ramachandran. Tata McGraw-Hill. 2006.
3. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of IndiaPvt.Ltd,3rdEdition, New Delhi,2007.
4. Sastry, S. S, "Introductory Methods of Numerical Analysis ", PHI Learning Pvt.Ltd, 5thEdition, 2015.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade &CGPA of 3.27

Course code	21CE45IT	Semester	IV			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	BASICS OF APPLIED SOIL MECHANICS		2	0	4	4

COURSE OBJECTIVES:

- To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
- To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils. To impart knowledge of design of both finite and infinite slopes.

PREREQUISITE:

- Basic knowledge from Applied geology.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C405.1	***Classify*** the soil and assess the engineering properties, based on index properties	K3
C405.2	***Understand*** the stress concepts and interpret the permeability in soils	K3
C405.3	***Illustrate*** the settlement in soils.	K3
C405.4	***Determine*** the shear strength of soil	K3
C405.5	***Analyze*** both finite and infinite slopes.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-01	PSO-02
C405.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C405.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C405.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C405.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C405.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I SOIL CLASSIFICATION AND COMPACTION 6

History – formation and types of soil – composition - Index properties – clay mineralogy structural arrangement of grains – description – Classification – BIS – US – phase relationship – Compaction-factors influencing Compaction-Effect of compaction on engineering properties of soils.

UNIT II EFFECTIVE STRESS AND PERMEABILITY 6

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena– –Permeability – Darcy's law– field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage - Two dimensional flow –Laplace's equation – Introduction to flow nets – Simple problems Sheet Pile and wier.

UNIT III STRESS DISTRIBUTION AND SETTLEMENT 6

Stress distribution in homogeneous and isotropic medium – Boussines of theory – (Point load, Line load and UDL) -Use of Newmark's influence chart –Components of settlement – Immediate and consolidation settlement – Factors influencing settlement

UNIT IV SHEAR STRENGTH 6

Shear strength -- Mohr-Coulomb failure criterion - Factors affecting shear strength of granular and cohesive soils - Pore pressure parameters.

UNIT V SLOPE STABILITY 6

Infinite slopes and finite slopes — Friction circle method – Use of stability number –Guidelines for location of critical slope surface in cohesive soil and non- cohesive soil.

Total: 30 Periods

LIST OF EXPERIMENTS

1. Determination of moisture content
2. Determination of specific gravity of soil
3. Sieve analysis
4. Field density test - Sand replacement method
5. Determination of liquid limit
6. Plastic limit test
7. Shrinkage limit test
8. Laboratory and field test– Proctor Compaction test
9. Determination of Permeability–Constant head and falling head methods.
10. Shear strength–Direct shear test
11. Tri axial compression test on cohesionless soil
12. Unconfined compression test
13. Vane shear test
14. CBR test

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Punmia, B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2017.
2. Murthy, V.N.S., “Text book of Soil Mechanics and Foundation engineering”, CBS Publishers Distribution Ltd., New Delhi. 2014
3. Arora, K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
4. Gopal Ranjan, A S R Rao, “Basic and Applied Soil Mechanics” New Age International Publication, 3rd Edition, 2016.

REFERENCES:

1. McCarthy, D.F., “Essentials of Soil Mechanics and Foundations: Basic Geo techniques”. Prentice – Hall, 2006.
2. Coduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India Pvt. Ltd. New Delhi, 2010.
3. Braja M Das, “Principles of Geotechnical Engineering”, Cengage Learning India Private Limited, 8th Edition, 2014.
4. Palanikumar.M., “Soil Mechanics”, Prentice Hall of India Pvt. Ltd, Learning Private Limited Delhi, 2013.
5. Craig.R.F., “Soil Mechanics”, E & FNS pon, London and New York, 2012.
6. Purushothama Raj. P., “Soil Mechanics and Foundations Engineering”, 2nd Edition, Pearson Education, 2013.
7. Venkatramaiah.C., “Geotechnical Engineering”, New Age International Pvt. Ltd., New Delhi,2017.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21MC02T	Semester	IV			
Category	MANDATORY COURSE (MC)		L	T	P	C
Course Title	ENVIRONMENTAL SCIENCES (COMMON FOR ALL BRANCHES EXCEPT CHEMICAL)		2	0	0	0

COURSE OBJECTIVES:

- To study the nature, interrelationship between living organism and environment, biodiversity, natural resources, pollution control and waste management.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To appreciate the importance of environment by assessing its impact on the human world.

PREREQUISITE:

- Basic awareness on environment.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C406.1	***Illustrate*** the interrelationship between living organism and environment.	K2
C406.2	***Relate*** Public awareness, environmental pollution and its problem.	K2
C406.3	***Classify*** the dynamic processes and the features of natural resources.	K2
C406.4	***Measure*** the development and improvement in standard of living.	K2
C406.5	***Summarize*** the knowledge about human health and welfare.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C406.1	1	-	-	-	-	-	1	-	-	-	-	-
C406.2	2	-	-	-	-	-	1	-	-	-	-	-
C406.3	1	-	-	-	-	-	1	-	-	-	-	-
C406.4	1	-	-	-	-	-	2	1	-	-	-	1
C406.5	1	-	-	-	-	-	1	1	-	-	-	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 0**

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) –Introduction to biodiversity definition: genetic, species and ecosystem diversity –biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity –threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts –endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds, etc., Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II NATURAL RESOURCES 6

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources. Field study of local area to document environmental assets – river / forest / grassland /
hill / mountain.

UNIT III ENVIRONMENTAL POLLUTION AND DISASTER MANAGEMENT 6

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution(c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards, accidents and holocaust – solid waste management: causes, effects and control measures of municipal solid wastes- E waste and Scrap tyres – Recycling of Plastic, Glass and Paper wastes- role of an individual in prevention of pollution – pollution case studies –disaster management: floods, earthquake, cyclone and landslides- case studies. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 6

From unsustainable to sustainable development- Equitable use of resources for sustainable lifestyles – urban problems related to energy –water conservation, rain water harvesting, watershed

management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of nongovernmental organization- environmental ethics: Issues and possible solutions – principles of green chemistry–climate change, global warming, acid rain, ozone layer depletion, case studies. – wasteland reclamation – consumerism and waste products –environment protection act – Air (Prevention and Control of Pollution) act – Water(Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – environmental impact assessment- enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – women and child welfare – HIV/AIDS –SARS- Covid-19- role of information technology in environment and human health – Case studies.

Total: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill, New Delhi, 2014.
2. Anubha Kaushik, and Kaushik, C. P., Environmental Science and Engineering, New Age International Publishers, 6thEdition, 2019.

REFERENCES:

1. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses, 2nd Edition, University Grants Commission, Universities Press, 2013.
2. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Pearson Education, 2004.
3. Tyler Miller, G., and Scott E. Spoolman, Environmental Science, Cengage Learning India Pvt, Ltd, Delhi, 2014.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE47P	Semester	IV			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	HYDRAULIC ENGINEERING LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- To impart knowledge on Measure the flow in pipe section using orifice meter and venture meter and discharge in channels using notches.
- To determine the major and minor losses in pipes.
- To study the characteristics of turbines.
- To study the characteristics of pumps.

PREREQUISITE:

- Basic knowledge from fluid mechanics and Applied hydraulics.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C407.1	***Measure*** the flow in a pipe.	K3
C407.2	***Experiment*** with the energy loss in pipe flow.	K3
C407.3	***Examine*** the discharge in an open channel flow.	K4
C407.4	***Demonstrate*** the characteristics curves of pumps.	K3
C407.5	***Study*** the performance of different types of hydraulic turbines.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C407. 1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C407. 2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C407. 3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C407. 4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C407. 5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

LIST OF EXPERIMENTS: **No. of Credits: 2**

A. Flow Measurement

1. Calibration of Rotameter
2. Calibration of Venturimeter
3. Calibration of Orificemeter
4. Bernoulli's Experiment
5. Flow measurement in Open channel using notches

B. Losses in Pipes

6. Determination of friction factor in pipes
7. Determination of minor losses

C. Pumps

8. Characteristics of Centrifugal pumps
9. Characteristics of Gear pump
10. Characteristics of Impact jet of vanes
11. Characteristics of Reciprocating pump

D. Turbines

12. Characteristics of Pelton wheel turbine
13. Characteristics of Francis turbine
14. Characteristics of Kaplan turbine

Total: 60 Periods

REFERENCES:

1. Sarbjit Singh."Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009.
2. "Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, 2004.
3. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2000.
4. Subramanya K. "Flow in open channels", Tata McGraw Hill Publishing Company, 2001.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21EE01P	Semester	IV			
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)		L	T	P	C
Course Title	MINI PROJECT – I		0	0	2	1

COURSE OBJECTIVES:

- To introduce project based experiential learning

PREREQUISITE:

- All Core Courses

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C408.1	***Formulate*** specific problem statements for ill-defined real life problems with reasonable assumptions and constraints.	K6
C408.2	***Make use of*** literature search and / or patent search in the area of interest	K3
C408.3	***Conduct*** experiments / design and analysis / solution iterations and document the results/ Perform testing of materials	K4
C408.4	***Evaluate*** the results and arrive at scientific conclusions / products / solution	K5
C408.5	***List*** the results in the form of technical report / presentation	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C408.1	3	3	2	2	2	1	1	1	3	2	2	2	2	2
C408.2	3	3	2	2	2	1	1	1	3	2	2	2	2	2
C408.3	3	3	2	2	2	1	1	1	3	2	2	2	2	2
C408.4	3	3	2	2	2	1	1	1	3	2	2	2	2	2
C408.5	3	3	2	2	2	1	1	1	3	2	2	2	2	2

Note: 1: Slight; 2: Moderate; 3: Substantial

DOMAINS:

Students are advised to carry out the projects in the following domains:

- Green Building
- Utilization of Innovative Construction Materials
- Analysis of structures using soft wares
- GIS
- Remote sensing

Total: 30 Periods

ONLINE RESOURCES:

1. https://swayam.gov.in/nc_details/NPTEL
2. https://www.sciencedirect.com/
3. https://theconstructor.org/
4. https://constructioncivil.com/
5. https://engineeringcivil.org/
6. https://www.coursera.org/

V SEMESTER

SEMESTER V										
S. No.	**Course Code**	**Course Title**	**Category**	**CIE Marks**	**SEE Marks**	**Total marks**	**Credits**			
							L	**T**	**P**	**C**
THEORY										
1	21CE51T	Design of Reinforced Concrete Elements	PCC	40	60	100	3	1	0	4
2	21CE52T	Analysis of Structures I	PCC	40	60	100	3	0	0	3
3	21CE53T	Principles of Foundation Engineering	PCC	40	60	100	3	0	0	3
4	21CE54T	Water Supply Engineering	PCC	40	60	100	3	0	0	3
5	21CE55IT	Highway Engineering	PCC	50	50	100	2	0	4	4
6	-	Open Elective I	OEC	40	60	100	3	0	0	3
PRACTICAL										
7	21EE03P	Technical Seminar	EEC	100	-	100	0	0	2	1
8	21CE58P	Survey Camp	PCC	60	40	100	0	0	0	1
TOTAL										**22**

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE51T	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DESIGN OF REINFORCED CONCRETE ELEMENTS		3	1	0	4

COURSE OBJECTIVES:

- To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

PREREQUISITE:

- Knowledge on Concrete Technology and Construction Materials Laboratory

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C501.1	***Design*** the singly and doubly RC beams by working stress method & limit state method.	K4
C501.2	***Analyse*** and design of flanged beams by limit state method and sign of beams for shear, bond and torsion.	K4
C501.3	***Design*** the various types of slabs and staircase by limit state method.	K4
C501.4	***Design*** columns for axial, uni axial and biaxial eccentric loadings.	K4
C501.5	***Design*** the footing by limit state method.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C501.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C501.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C501.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C501.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C501.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I INTRODUCTION **9+3**

Objective of structural design-Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC –Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced Rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods.

UNIT II DESIGN OF BEAMS **9+3**

Analysis and design of Flanged beams for – Use of design aids for Flexure - Behavior of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behavior of rectangular RC beams in shear and torsion - Design of RC members for combined Bending, Shear and Torsion.

UNIT III DESIGN OF SLABS AND STAIRCASE **9+3**

Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams-Two way slab- Design of simply supported and continuous slabs using IS code coefficients - Corbels - Types of Staircases – Design of dog-legged Staircase.

UNIT IV DESIGN OF COLUMNS **9+3**

Types of columns –Axially Loaded columns – Design of short Rectangular Square and circular columns –Design of Slender columns- Design for Uni axial and Biaxial bending using Column Curves.

UNIT V DESIGN OF FOOTINGS **9+3**

Concepts of Proportioning footings and foundations based on soil properties - Design of wall footing – Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings Design of Combined Rectangular footing for two columns only.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Krishnaraju.N “Design of Reinforced Concrete Structures “, CBS Publishers & Distributors Pvt. Ltd., New Delhi, 2015
2. Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, Pvt. Ltd., New Delhi, 2008.
3. Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
4. Subramanian,N., “Design of Reinforced Concrete Structures”, Oxford University Press, New Delhi, 2019.
5. Ramachandra, “Limit state Design of Concrete Structures “Standard Book House, New Delhi, 2016.

REFERENCES:

1. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, “Limit State Design of Reinforced Concrete”, Laxmi Publication Pvt. Ltd., New Delhi, 2016.
2. Jain, A.K., “Limit State Design of RC Structures”, Nemchand Publications, Roorkee, 2016.
3. Sinha, S.N., “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Ltd. New Delhi, 2017.
4. Unnikrishna Pillai, S., Devdas Menon, “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Ltd., 2021
5. Bandyopadhyay. J.N., "Design of Concrete Structures", Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
6. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000
7. SP16,“Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE52T	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	ANALYSIS OF STRUCTURES I		3	0	0	3

COURSE OBJECTIVES:

- To introduce the students to basic theory and concepts of classical methods of structural analysis

PREREQUISITE:

- Engineering Mechanics, Strength of materials I & II

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C502.1	***Solve*** the continuous beams, plane frames and plane trusses by strain energy method	K3
C502.2	***Analyse*** the continuous beams and rigid frames by using slope defection method	K4
C502.3	***Analyse*** the continuous beams and rigid frames by using moment distribution method.	K4
C502.4	**Analyse** of three hinged, two hinged and fixed arches.	K4
C502.5	**Analyse** the suspension bridges with stiffening girders	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO. No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C502.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C502.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C502.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C502.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C502.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No of Credits: 3**

UNIT I STRAIN ENERGY METHOD **9**

Determination of Static and Kinematic Indeterminacies – Analysis of continuous beams, plane frames and indeterminate plane trusses by strain energy method and (up to two degree of redundancy).

UNIT II SLOPE DEFLECTION METHOD **9**

Slope deflection equations – Equilibrium conditions - Analysis of continuous beams and rigid frames - Support settlements.

UNIT III MOMENT DISTRIBUTION METHOD **9**

Stiffness and carry over factors – Distribution and carryover of moments - Analysis of continuous Beams- Plane rigid frames with and without sway – Support settlement.

UNIT IV ARCHES **9**

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

UNIT V CABLES AND SUSPENSION BRIDGES **9**

Equilibrium of cable – length of cable - anchorage of suspension cables – stiffening girders - cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Bhavikatti,S.S, Structural Analysis,Vol.1 & 2,Vikas Publishing House Pvt. Ltd., New Delhi-4, 2014.
2. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt. Ltd., New Delhi-4, 2014.
3. Vazirani.V.N and Ratwani, M.M, Analysis of Structures, Vol. II, Khanna Publisers, 2015.
4. Pandit G.S. and Gupta S.P., Structural Analysis– A Matrix Approach, Tata McGraw Hill Publishing Company Ltd.,2006

REFERENCES:

1. Punmia. B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004. New Delhi, 2003
2. William Weaver, Jrand James M.Gere, Matrix analysis of framed structures, CBS Publishers & Distributors, New Delhi,1995
3. Hibbeler, R.C., Structural Analysis, VII Edition, Prentice Hall, 2012.
4. Reddy.C.S ― Basic Structural Analysis I, Tata McGraw Hill Publishing Company, 2005.
5. Rajasekaran. S, &G. Sankara subramanian., ―Computational Structural Mechanics‖, PHI Learning Pvt. Ltd, 2015.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE53T	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	PRINCIPLES OF FOUNDATION ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on the concepts of foundation design.
- To give an overview of foundations provide support for structures, transferring their load to layers of rock or soil to have sufficient bearing capacity.

PREREQUISITE:

- Basics and fundamentals of soil mechanics and fluid mechanics.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C503.1	***Understand*** the principles and methods of Geotechnical Exploration	K2
C503.2	***Analyze*** and design the shallow foundations	K4
C503.3	***Analyze*** the footings and rafts	K4
C503.4	***Determine*** the load carrying capacity of piles	K4
C503.5	***Analyze*** the stability of retaining walls	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C503.1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C503.2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C503.3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C503.4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C503.5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Types of foundation, Factors affecting the selection of type of foundations, steps in choosing types of foundation based on soil condition, Objectives and planning of exploration program – Methods of exploration – Auguring and boring – Wash boring and rotary drilling – Depth and spacing of bore holes – Soil samples – Representative and undisturbed – Sampling methods – Split spoon sampler, Thin wall sampler, Stationary piston sampler – Penetration tests (SPT and SCPT) – Data interpretation – Strength parameters – Bore log report and Selection of foundation.

UNIT II SHALLOW FOUNDATIONS - BEARING CAPACITY & SETTLEMENTS 9

Types – choice of foundation – location and depth – safe bearing capacity – shear criteria – Terzaghis, and IS code methods – settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

UNIT III FOOTINGS AND RAFTS 9

Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for rigid behaviour – Minimum thickness – Codal provision

UNIT IV PILE FOUNDATIONS 9

Introduction, types of piles and their function, factors influencing selection of pile, their method of installation and their load carrying characteristics for cohesive and granular soils, piles subjected to vertical loads- pile load carrying capacity from static formula, dynamic formulae (ENR and Hiley), penetration test data & Pile load test (IS 2911). Pile group: carrying capacity, efficiency and settlement. Negative skin friction.

UNIT V RETAINING WALLS 9

Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Pressure on the wall due to live load – Stability analysis of retaining walls – Codal provisions.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition 2017.
2. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation engineering", CBS Publishers Distribution Ltd., New Delhi. 2014.
3. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).

REFERENCES:

1. McCarthy, D.F., “Essentials of Soil Mechanics and Foundations: Basic Geo Techniques”. Prentice – Hall, 2006.
2. Coduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India Pvt. Ltd. New Delhi, 2010.
3. Braja M Das, “Principles of Geotechnical Engineering”, Cengage Learning India Private Limited, 8th Edition, 2014.
4. Palanikumar.M, “Soil Mechanics”, Prentice Hall of India Pvt. Ltd, Learning Private Limited Delhi, 2013.
5. Craig.R.F, “Soil Mechanics”, E & FNS pon, London and New York, 2012.
6. Purushothama Raj. P., “Soil Mechanics and Foundations Engineering”, 2nd Edition, Pearson Education, 2013.
7. Venkatramaiah.C, “Geotechnical Engineering”, New Age International Pvt. Ltd., New Delhi, 2017.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE54T	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	WATER SUPPLY ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- To estimate the water demand, population forecasting, sources of water and water quality characteristics and to be familiar with water quality standards.
- To equip the students with the principles and design of water treatment units and distribution system.

PREREQUISITE:

- Basics of Physics and Chemistry
- Basics of Environmental Science

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C504.1	***Identify*** the sources of water, understanding of water quality criteria and standards, and their relation to public health	K3
C504.2	***Design*** *the suitable conveyance system.*	K3
C504.3	***Design*** the various functional units in water treatment	K4
C504.4	***Adopt*** the advanced water treatment methods.	K4
C504.5	***Design*** the water distribution networks.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C504.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C504.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C504.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C504.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C504.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION - SOURCES OF WATER 9

Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater –Impounding Reservoir- Storage zones– Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.

UNIT II CONVEYANCE SYSTEM 9

Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.

UNIT III TREATMENT OF WATER 9

Objectives – Unit operations and processes – Principles, functions and design of water treatment plant units, aerators of flash mixers, Coagulation aided sedimentation and flocculation – Clarifloccuator – Plate and tube settlers – Filtration & sand filters – Disinfection – Residue Management – Construction, Operation and Maintenance aspects.

UNIT IV ADVANCED WATER TREATMENT 9

Principles & functions of aeration – Water softening – Desalination- R.O. Plant – demineralization – Adsorption – Ion exchange – Membrane Systems – RO Reject Management – Iron and Manganese removal – Defluoridation – Construction and Operation & Maintenance aspects – MBR process – Recent advances.

UNIT V WATER DISTRIBUTION SYSTEM 9

Requirements of water distribution – Components – Service reservoirs – Functions – Network design – Analysis of distribution networks –Computer applications – Appurtenances – Leak detection. Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010.
3. Punmia, B.C.,Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2014.

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.
3. IS10500:2012 Water Quality Standards, New Delhi 2012.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE55IT	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	HIGHWAY ENGINEERING		2	0	4	4

COURSE OBJECTIVES:

- To give an overview on highway planning, design and construction, maintenance and financing of highways as per specifications and practices.

PREREQUISITE:

- Basics of Concrete Technology, Construction Materials
- Basics of Soil Mechanics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C505.1	***Build*** knowledge on planning and aligning of highway	K3
C505.2	***Apply*** the concept of Geometric design of highways	K3
C505.3	***Apply*** the design of flexible and rigid pavements.	K3
C505.4	***Develop*** the knowledge on Highway construction materials, properties, testing methods	K3
C505.5	***Apply*** the concept of pavement management system, evaluation of distress and maintenance of pavements	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C505.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C505.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C505.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C505.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C505.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 2**

UNIT I HIGHWAY PLANNING AND ALIGNMENT 6

Significance of highway planning – Modal limitations towards sustainability - History of road development in India – factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods - Classification of highways – Locations and functions – Typical cross sections of Urban and Rural roads.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 6

Sight distances - Horizontal curves, Super elevation, transition curves, widening of curves – Vertical curves, gradients, hairpin bends – Lateral and vertical clearance at underpasses – IRC standards.

UNIT III HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE 6

Highway construction materials, properties, testing methods – CBR Test for subgrade - Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials – Geo-Textiles, Geo-Membrane – Quality control measures.

UNIT IV DESIGN OF FLEXIBLE PAVEMENTS 6

Pavement components and their role - Design principles -Design practice for flexible (IRC methods only) – Embankments- Problems in Flexible pavement design.

UNIT V DESIGN OF RIGID PAVEMENTS (IRC METHODS ONLY) 6

Design principles - Design practice for rigid Pavements (IRC methods only) – Embankments- Problems in Rigid pavement design.

Total: 30 Periods

LIST OF EXPERIMENTS: No. of Credits: 2

I. TESTS ON AGGREGATES

1. Specific Gravity
2. Los Angeles Abrasion Test
3. Water Absorption of Aggregates

II. TESTS ON BITUMEN

4. Specific Gravity of Bitumen
5. Penetration Test
6. Softening Point Test
7. Ductility Test

III. TESTS ON BITUMINOUS MIXES

8. Stripping Test

9. Determination of Binder Content

10. Marshall Stability and Flow Values

IV. STRENGTH TEST ON CONCRETE

11. Compressive strength - Cube & split tensile - Cylinder

12. Flexure test

13. Modulus of Elasticity

V. DEMONSTRATION

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Veeraragavan.A, Khanna.K and Justo C.E.G. Highway Engineering, Nem Chand and Brothers Publishers, 2016 (10^{th} edition).
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010.
3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.

REFERENCES:

1. Partha Chakroborty and Animesh Das. Principles of Transportation Engineering, PHI Learning Private Limited, 2017 (Second edition).
2. R.Srinivasa Kumar. Textbook of Highway Engineering, Universities Press (India) Pvt. Ltd., Hyderabad, 2011.
3. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision), IRC: 37-2018
4. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2018
5. Methods for testing tar and bituminous materials, IS: 1201–1978 to IS:1220– 1978, Bureau of Indian Standards
6. Methods of test for aggregates, IS: 2386 – 1978, Bureau of Indian Standards
7. IRC: 73-2020 "Geometric Design Standards for Rural (Non-Urban) Highways" (First Revision)

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21EE03P	Semester	V			
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)		L	T	P	C
Course Title	TECHNICAL SEMINAR		0	0	2	1

COURSE OBJECTIVES:

- To inculcate the habit of critical thinking
- To emphasize the importance of reading and effective writing
- To expose meta-disciplinary research works
- To cultivate a scholarly habit

PREREQUISITE:

- Professional Communication Skill and Technical Writing Skill

COURSE OUTCOMES:

CO. No.	Course Outcome	Blooms level
On successful completion of this Course, students will be able to		
C507.1	***Define*** a compelling and viable problem, question, or project by exploring the purpose and philosophy on topics in technology	K2
C507.2	***Learn*** to infuse material from primary and secondary sources with their own ideas in research papers	K2
C507.3	***Understand*** the stages of writing process which strengthens the technical and workplace writing tasks	K2
C507.4	***Demonstration*** ability to synthesize and assess arguments in scholarly articles and monographs professionally	K3
C507.5	***Develop*** Presentation and Communication skills.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C507.1	2	2	-	-	-	-	-	-	3	2	-	2	2	2
C507.2	2	2	-	-	-	-	-	-	3	2	-	2	2	2
C507.3	2	2	-	-	-	-	-	-	3	2	-	2	2	2
C507.4	2	2	-	-	-	-	-	-	3	2	-	2	2	2
C507.5	2	2	-	-	-	-	-	-	3	2	-	2	2	2

Note: 1: Slight; 2: Moderate; 3: Substantial

DOMAINS:

Students are advised to prepare any topic from the following domains of Civil Engineering and present for not less than 15 minutes. Other Students can have a discussion after the presentation. Evaluation will be on the basis of presentation skills, Content delivered in the Power point and the report submitted.

- Green Building
- Utilization of Innovative Construction Materials
- Analysis of structures using soft wares
- GIS
- Remote sensing

Total: Periods

ONLINE RESOURCES:

1. https://swayam.gov.in/nc_details/NPTEL
2. https://www.sciencedirect.com/
3. https://theconstructor.org/
4. https://constructioncivil.com/
5. https://engineeringcivil.org/
6. https://www.coursera.org/

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE58P	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	SURVEY CAMP		0	0	0	1

COURSE OBJECTIVES:

- To provide practical knowledge for implementation of different survey works.
- To provide the students real field based exposure to learn and apply different surveying methods.

PREREQUISITE:

- Surveying Instruments and Measurements
- Surveying Laboratory

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C508.1	***Identify*** different types of survey instruments.	K2
C508.2	***Apply*** the modern surveying techniques in field to establish horizontal control network.	K3
C508.3	***Apply*** the modern surveying techniques in field to establish vertical control network.	K3
C508.4	***Classify*** and study the different survey adjustment techniques	K3
C508.5	***Familiarize*** in setting out work with different computation process	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C508.1	2	1	1	-	2	1	-	-	-	-	-	1	1	-
C508.2	2	1	1	-	2	1	-	-	-	-	-	1	1	-
C508.3	2	1	1	-	2	1	-	-	-	-	-	1	1	-
C508.4	2	1	1	-	2	1	-	-	-	-	-	1	1	-
C508.5	2	1	1	-	2	1	-	-	-	-	-	1	1	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 1**

a) Preparation of Topographic Map

- Mapping detailed land features.
- Mapping and describing topographical variations.
- Reconnaissance Survey for selection of Control Framework, Observation Stations.
- Establishment of Horizontal Control Network (Traversing and Triangulation methods).
- Establishment of Vertical Control Network using Level Net.
- Adjustment of Weighted Observations.
- Measurement of Coordinates (X,Y and Z) of Features.

b) Setting out work and Computation work

- Setting out simple Road curve by linear method
- L–section and cross section of Rural Roads
- Setting out simple Railway curve by Instrument method
- Detailed survey of irrigation command area
- Detailed survey of main canal alignment and headwork

TEXT BOOKS:

1. Punmia B.C., Surveying, Volume 1, Laxmi Publications, 2016
2. Punmia B.C. Surveying, Volume 2, Laxmi Publications, 2016
3. N N Basak, Surveying and Levelling TMH Private Ltd, 2013.

VI SEMESTER

SEMESTER VI										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21CE61T	Waste Water Engineering	PCC	40	60	100	3	0	0	3
2	21CE62T	Design of Steel Structures	PCC	40	60	100	3	1	0	4
3	21CE63T	Analysis of Structures II	PCC	40	60	100	3	0	0	3
4	21CE64T	Irrigation Engineering and Water Management	PCC	40	60	100	3	0	0	3
5	-	Professional Elective - I	PEC	40	60	100	3	0	0	3
6	-	Open Elective - II	OEC	40	60	100	3	0	0	3
PRACTICAL										
7	21CE67P	Environmental Engineering Laboratory	PCC	60	40	100	0	0	4	2
8	21EE02P	Mini Project - II	EEC	60	40	100	0	0	2	1
TOTAL										**22**

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE61T	Semester	VI			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	WASTE WATER ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation and maintenance of sewage treatment plants.

PREREQUISITE:

- Fluid mechanics, Applied hydraulic Engineering and Water supply Engineering.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C601.1	***Estimate*** sewage generation and design sewer system including sewage pumping stations	K3
C601.2	***Design*** primary sewage treatment units	K3
C601.3	***Design*** secondary sewage treatment units	K3
C601.4	***Identify*** the standard methods for disposal of sewage.	K3
C601.5	***Design*** sludge treatment units and disposal	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C601.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C601.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C601.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C601.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C601.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I PLANNING AND DESIGN OF SEWERAGE SYSTEM 9

Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design – Storm drainage-Storm runoff estimation – sewer appurtenances – corrosion in sewers – prevention and control – sewage pumping-drainage in buildings-plumbing systems for drainage - Rain Water ting.

UNIT II PRIMARY TREATMENT OF SEWAGE 9

Objectives – Unit Operations and Processes – Selection of treatment processes –- Onsite sanitation - Septic tank- Grey water harvesting – Primary treatment – Principles, functions and design of sewage treatment units - screens - grit chamber-primary sedimentation tanks – Construction, Operation and Maintenance aspects.

UNIT III SECONDARY TREATMENT OF SEWAGE 9

Objectives – Selection of Treatment Methods – Principles, Functions, - Activated Sludge Process and Extended aeration systems -Trickling filters– Sequencing Batch Reactor(SBR) – Membrane Bioreactor - UASB – Waste Stabilization Ponds – - Other treatment methods -Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment – Construction, Operation and Maintenance aspects

UNIT IV DISPOSAL OF SEWAGE 9

Standards for– Disposal - Methods – dilution – Mass balance principle - Self purification of river Oxygen sag curve – de-oxygenation and re-aeration - Streeter–Phelps model - Land disposal – Sewage farming – sodium hazards - Soil dispersion system.

UNIT V SLUDGE TREATMENT AND DISPOSAL 9

Objectives - Sludge characterization – Thickening - Design of gravity thickener- Sludge digestion – Standard rate and High rate digester design- Biogas recovery – Sludge Conditioning and Dewatering – Sludge drying beds- ultimate residue disposal – recent advances.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers,New Delhi, 2017.
2. Duggal K.N., “Elements of Environmental Engineering” S.Chand and Co. Ltd., New Delhi, 2014.
3. Punmia, B.C., Jain, A.K., and Jain.A.K.., Environmental Engineering, Vol.II, Laxmi Publications, 2010.

REFERENCES:

1. Manual on Sewerage and Sewage Treatment Systems Part A,B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013
2. Metcalf and Eddy- Wastewater Engineering–Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2010.
3. Syed R. Qasim “Wastewater Treatment Plants”, CRC Press, Washington D.C.,2010

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE62T	Semester	VI			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DESIGN OF STEEL STRUCTURES		3	1	0	4

COURSE OBJECTIVES:

- Introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections. Design of structural systems such as roof trusses, gantry girders as per provisions of current code (IS 800 - 2007) of practice for working stress and Limit state Method.

PREREQUISITE:

- Knowledge on Design of reinforced concrete elements
- Knowledge on Analysis of structure I.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C602. 1	***Understand*** the concepts of various design philosophies.	K3
C602. 2	***Design*** common bolted and welded connections for steel structures.	K4
C602. 3	***Design*** tension members and understand the effect of shear lag.	K4
C602. 4	***Design*** axially loaded columns and column base connections.	K4
C602. 5	***Design*** beams and Purlins in roof trusses.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C602. 1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C602. 2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C602. 3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C602. 4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C602. 5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I INTRODUCTION AND ALLOWABLE STRESS DESIGN 12

Structural steel types – Mechanical Properties of structural steel- Indian structural steel products- Steps involved in the Deign Process -Steel Structural systems and their Elements- -Type of Loads on Structures and Load combinations- Code of practices, Loading standards and Specifications - Concept of Allowable Stress Method, and Limit State Design Methods for Steel structures-Relative advantages and Limitations-Strengths and Serviceability Limit states.

Allowable stresses as per IS 800 section 11 -Concepts of Allowable stress design for bending and Shear –Check for Elastic deflection-Calculation of moment carrying capacity –Design of Laterally supported Solid Hot Rolled section beams-Allowable stress deign of Angle Tension and Compression Members and estimation of axial load carrying capacity.

UNIT II CONNECTIONS IN STEEL STRUCTURES 12

Type of Fasteners- Bolts Pins and welds- Types of simple bolted and welded connections Relative advantages and Limitations-Modes of failure-the concept of Shear lag-efficiency of joints- Axially loaded bolted connections for Plates and Angle Members using bearing type bolts –Prying forces and Hanger connection– Design of Slip critical connections with High strength Friction Grip bolts.- Design of joints for combined shear and Tension- Eccentrically Loaded Bolted Bracket Connections- Welds-symbols and specifications- Effective area of welds-Fillet and but Welded connections-Axially Loaded connections for Plate and angle truss members and Eccentrically Loaded bracket connections.

UNIT III TENSION MEMBERS 12

Tension Members - Types of Tension members and sections –Behaviour of Tension Members-modes of failure-Slenderness ratio- Net area – Net effective sections for Plates, Angles and Tee in tension –Concepts of Shear Lag- Design of plate and angle tension members-design of built up tension Members-Connections in tension members – Use of lug angles – Design of tension splice.

UNIT IV COMPRESSION MEMBERS 12

Types of compression members and sections–Behaviour and types of failures-Short and slender columns- Current code provisions for compression members- Effective Length, Slenderness ratio– Column formula and column curves- Design of single section and compound Angles-Axially Loaded solid section Columns- Design of Built up Laced and Battened type columns – Design of column bases – Plate and Gusseted bases for Axially loaded columns- Splices for columns.

UNIT V DESIGN OF FLEXURAL MEMBERS 12

Types of steel Beam sections- Behaviour of Beams in flexure- Codal Provisions – Classification of cross sections- Flexural Strength and Lateral stability of Beams –Shear Strength-Web Buckling, Crippling and defection of Beams- Design of laterally supported Beams- Design of solid rolled section Beams- Design of Plated beams with cover plates - Design Strength of Laterally unsupported Beams – Design of laterally unsupported rolled section Beams- Purlin in Roof Trusses-Design of Channel and I section Purlins..

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1 Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

2 Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2017.

3 Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.

REFERENCES:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2018.

2. Sai Ram. K.S. “Design of Steel Structures “Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2nd Edition, 2015, www.pearsoned.co.in/kssairam.

3. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.

4. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800– 2007, IK International Publishing House Pvt. Ltd., 2016

5. SP 6(1) Hand book on structural Steel Sections

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE63T	Semester	VI			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	ANALYSIS OF STRUCTURES II		3	0	0	3

COURSE OBJECTIVES:

- To learn the method of drawing influence lines and its uses in various applications like beams and planes
- To introduce the students about the basic theory and concepts of classical methods of structural analysis
- To learn about the Plastic analysis of beams and rigid frames.

PREREQUISITE:

- Strength of materials I & II, Analysis of structures I.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C603. 1	***Solve*** influence lines for statically determinate structures and calculate critical stress resultants.	K3
C603. 2	***Apply*** Muller Breslau principle and draw the influence lines for statically indeterminate beams.	K3
C603. 3	***Analyse*** the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method.	K4
C603. 4	***Understand*** the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames.	K4
C603. 5	***Understand*** the concept of Plastic analysis and the method of analyzing beams and rigid frames.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C603. 1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C603. 2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C603. 3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C603. 4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C603. 5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INFLUENCE LINES FOR DETERMINATE BEAMS 9

Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.

UNIT II INFLUENCE LINES FOR INDETERMINATE BEAMS 9

Muller Breslau's principle– Influence line for Shearing force, Bending Moment and support reaction components of propped cantilever, continuous beams (Redundancy restricted to one), and fixed beams.

UNIT III FLEXIBLITY METHOD 9

Primary structures - Compatibility conditions – Formation flexibility matrices - Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach

UNIT IV STIFFNESS METHOD 9

Restrained structure –Formation of stiffness matrices - equilibrium condition - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method.

UNIT V PLASTIC ANALYSIS 9

Plastic theory - Statically indeterminate structures – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Bhavikatti, S.S, Structural Analysis, Vol.1 & 2, Vikas Publishing House Pvt.Ltd.New Delhi-4, 2014.
2. Vaidyanadhan, R., and Perumal, P., 'Comprehensive Structural Analysis', Vol. II, Laxmi Publications Pvt. Ltd., New Delhi, 2023
3. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications, 2017.
4. Vazrani.V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.

REFERENCES:

1. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt.Ltd. New Delhi-4, 2014.
2. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2010.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE64T	Semester	VI			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	IRRIGATION ENGINEERING AND WATER MANAGEMENT		3	0	0	3

COURSE OBJECTIVES:

- The student is exposed to different phases in irrigation practices and planning and management of irrigation.
- Further they will be imparted required knowledge on Irrigation storage and distribution canal system and Irrigation management.

PREREQUISITE:

- Water supply engineering and Environmental engineering.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C604.1	***Outline*** crop water requirements.	K2
C604.2	***Understand*** the methods and management of irrigation.	K2
C604.3	***Design*** Impounding structures	K3
C604.4	***Demonstrate*** sources and quality of water	K3
C604.5	***Apply*** the latest techniques used in water management	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C604.1	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C604.2	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C604.3	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C604.4	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C604.5	2	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I CROP WATER REQUIREMENT 9

Need and classification of irrigation- historical development and merits and demerits of irrigation-types of crops-crop season-duty, delta and base period- consumptive use of crops- estimation of Evapotranspiration using experimental and theoretical methods.

UNIT II IRRIGATION METHODS 9

Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation – design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Waterdistribution system- Irrigation efficiencies.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Types of Impounding structures - Gravity dam – Forces on a dam -Design of Gravity dams; Earthdams, Arch dams- Diversion Head works - Weirs and Barrages.

UNIT IV SOURCES AND QUALITY OF WATER 9

Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics – Analytical techniques, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.

UNIT V WATER MANAGEMENT IN IRRIGATION 9

Modernization techniques- Rehabilitation – Optimization of water use-Minimizing water losses-On form development works-Participatory irrigation management- Water resources associations-Changing paradigms in water management-Performance evaluation-Economic aspects of irrigation.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Sharma, R.K., and Sharma, T.K., "Irrigation Engineering", S. Chand and Company, New Delhi, 2019.
2. Michael, A.M., "Irrigation Engineering", Vikas Publishers, New Delhi, 2014.
3. Garg, S.K., "Irrigation Engineering," Laxmi Publications, New Delhi, 2017.
4. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2018

REFERENCES:

1. Arora, K.R., "Irrigation, Water Power and Water Resources Engineering", Standard Publishers Distributors, New Delhi, 2022.
2. Basak, N.N., "Irrigation Engineering", Tata McGraw-Hill Publishing Co, New Delhi, 2012.
3. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2019.
4. Punmia, B.C.,Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications 2016.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE67P	Semester	VI			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	ENVIRONMENTAL ENGINEERING LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- To analyse the physical, chemical and biological characteristics of water and wastewater.
- To quantify the dosage requirement for coagulation process.
- To study the growth of micro-organism and its quantification.
- To study about the oxygen demand in water.
- To gain knowledge on water pollution and the treatment methods.

PREREQUISITE:

- Water supply engineering and Waste water engineering

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C607.1	***Quantify*** the pollutant concentration in water and wastewater	K3
C607.2	***Suggest*** the type of treatment required and amount of dosage required for the treatment	K3
C607.3	***Examine*** the conditions for the growth of micro-organisms	K4
C607.4	***Demonstrate*** the ability to write clear technical laboratorial reports.	K4
C607.5	***Understand*** the impact of engineering solutions in a global, economic and societal context.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C607.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C607.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C607.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C607.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C607.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

List of Experiment **No. of Credits: 2**

1. Determination of pH, Turbidity and conductivity in water.
2. Determination of Hardness in water.
3. Determination of Alkalinity and Acidity in water sample.
4. Determination of Chlorides in given samples.
5. Determination of Phosphates and Sulphates in given water samples.
6. Determination of iron and fluoride
7. Determination of Optimum Coagulant dosage in waste water sample.
8. Determination of residual chlorine and available chlorine in bleaching powder.
9. Determination of suspended, settable, volatile and fixed solids in waste water.
10. Determination of Dissolved Oxygen and BOD for the given sample.
11. Determination of COD for given sample.
12. Determination of Sodium and Potassium for the given sample.
13. Determination of SVI of Biological sludge and microscopic examination
14. Determination of MPN index of given water sample.

TOTAL: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Garg, S.K., "Environmental Engineering" Vol. II, Khanna Publishers, New Delhi, 2017.
2. Punmia, B.C., Jain, A.K., and Jain. A., "Environmental Engineering", Vol.II, Lakshmi Publications, News letter, 2017.

REFERENCES:

1. Standards Methods for the Examination of Water and Wastewater, 21st Edition, WPCF, APHA and AWWA, USA, 2016.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21EE02P	Semester	VI			
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)		L	T	P	C
Course Title	MINI PROJECT – II		0	0	2	1

COURSE OBJECTIVES:

- To introduce project based experiential learning.

PREREQUISITE:

- All Core Courses

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C608.1	***Formulate*** specific problem statements for ill-defined real life problems with reasonable assumptions and constraints.	K3
C608.2	***Make use of*** literature search and / or patent search in the area of interest	K3
C608.3	***Conduct*** experiments / design and analysis / solution iterations and document the results/ Perform testing of materials	K4
C608.4	***Evaluate*** the results and arrive at scientific conclusions / products / solution	K5
C608.5	***List*** the results in the form of technical report / presentation	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C608.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C608.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C608.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C608.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C608.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

DOMAINS:

Students are advised to carry out the projects in the following domains:

- Green Building
- Utilization of Innovative Construction Materials
- Analysis of structures using soft wares
- GIS
- Remote sensing
- Environmental impact
- Water quality
- Construction techniques

Total: 30 Periods

ONLINE RESOURCES:

- https://swayam.gov.in/nc_details/NPTEL
- https://www.sciencedirect.com/
- https://theconstructor.org/
- https://constructioncivil.com/
- https://engineeringcivil.org/
- https://www.coursera.org/

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE651PT	Semester	VI			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	DISASTER MANAGEMENT		3	0	0	3

COURSE OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

PREREQUISITE:

- Knowledge on Engineering Geology.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C651.1	***Explain*** different types of disasters, causes and their impact on environment and society	K2
C651.2	***Assess*** vulnerability and various methods of risk reduction measures as well as mitigation.	K3
C651.3	***Draw*** the hazard and vulnerability profile of india, Scenarios in the Indian context, disaster damage assessment and management.	K3
C651.4	***Plan*** and design of disaster management	K3
C651.5	***Develop*** and manage disaster development projects.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C651.1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C651.2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C651.3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C651.4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C651.5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION TO DISASTERS **9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc. - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) **9**

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- non-structural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT **9**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA **9**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation.

UNIT V CASE STUDIES - DISASTER MANAGEMENT **9**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2019. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2012
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2011.

REFERENCES:

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE652PT	Semester	VI			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	GEOGRAPHIC INFORMATION SYSTEM		3	0	0	3

COURSE OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, Disasters, disaster prevention and risk reduction.
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
- To develop rudimentary ability to respond to their surroundings with potential disaster Response in areas where they live, with due sensitivity.

PREREQUISITE:

- Knowledge on Engineering Geology.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C652.1	***Acquire*** basic idea about the fundamentals of GIS.	K3
C652.2	***Understand*** the types of data models.	K4
C652.3	***Get*** knowledge about data input and topology.	K3
C652.4	***Gain*** knowledge on data quality and standards.	K4
C652.5	***Understand*** data management functions and data output	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C652.1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C652.2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C652.3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C652.4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C652.5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I FUNDAMENTALS OF GIS **9**

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.

UNIT II SPATIAL DATA MODELS **9**

Database Structures – Relational, Object Oriented – Entities – ER diagram - data models - conceptual, logical and physical models - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs. Vector Models- TIN and GRID data models.

UNIT III DATA INPUT AND TOPOLOGY **9**

Scanner - Raster Data Input – Raster Data File Formats – Geo-referencing – Vector Data Input – Digitiser – Datum Projection and projection -Coordinate Transformation – Topology - Adjacency, connectivity and containment – Topological Consistency – Non topological file formats - Attribute Data linking – Linking External Databases – GPS Data Integration.

UNIT IV DATA QUALITY AND STANDARDS **9**

Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards –Interoperability - OGC - Spatial Data Infrastructure.

UNIT V DATA MANAGEMENT AND OUTPUT **9**

Import/Export – Data Management functions- Raster to Vector and Vector to Raster Conversion - Data Output - Map Compilation – Chart/Graphs – Multimedia – Enterprise Vs. Desktop GIS- distributed GIS.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2017.
2. Anji Reddy, M. "Textbook of Remote Sensing and Geographical Information System" 2 nd edition. BS Publications, Hyderabad, 2016.

REFERENCES:

1. Lo.C.P. Albert K.W. Yeung,"Concepts and Techniques of Geographic Information Systems", Prentice-Hall India Publishers, 2016.
2. Peter A.Burrough, Rachael A. McDonnell, “Principles of GIS", Oxford University Press, 2018.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE653PT	Semester	VI			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	TOTAL STATION AND GPS SURVEYING		3	0	0	3

COURSE OBJECTIVES:

- To understand the working of Total Station equipment and solve the surveying problems.

PREREQUISITE:

- Surveying instruments and measurements, Surveying laboratory.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C653.1	***Understand*** principles of total station and GPS instruments	K2
C653.2	***Propagate*** of EMR through atmosphere and corrections for its effects	K2
C653.3	***Utilize*** various types total station and GPS equipment and their applications	K3
C653.4	***Apply*** Various techniques available for surveying and mapping with total station and GPS.	K3
C653.5	***Conduct*** Survey with various types mine surveying equipment and cadastral surveying.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C653.1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C653.2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C653.3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C653.4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C653.5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVE 9

Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying. Classification - applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies- Refractive index (RI) - factors affecting RI-Computation of group for light and near infrared waves at standard and ambient conditions-Computation of RI for microwaves at ambient condition - Reference refractive index- Real time application of first velocity correction. Measurement of atmospheric parameters- Mean refractive index- Care and Maintenance of total station – trilateration – Applications.

UNIT II ELECTRO-OPTICAL AND MICROWAVE SYSTEM 9

Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments — Traversing and Trilateration-COGO functions, offsets and stake out-land survey applications.

UNIT III SATELLITE SYSTEM 9

Basic concepts of GPS - Historical perspective and development - applications - Geoid and Ellipsoid- satellite orbital motion - Keplerian motion — Kepler‘s Law - Perturbing forces - Geodetic satellite - Doppler effect - Positioning concept –GNSS, IRNSS and GAGAN - Different segments - space, control and user segments - satellite configuration — GPS signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - GPS receivers - Control requirement for Urban survey use of Satellite Imagery in boundary fixing.

UNIT IV GPS DATA PROCESSING 9

GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation — downloading the data RINEX Format — Differential data processing – software modules -solutions of cycle slips, ambiguities, Concepts of rapid, static methods with GPS - semi Kinematic and pure Kinematic methods -satellite geometry & accuracy measures - applications- long baseline processing- use of different softwares available in the market - Data processing Applications.

UNIT V HYDROGRAPHIC, MINE AND CADASTRAL SURVEYING 9

Reconnaissance – Route surveys for highways, railways and waterways – Hydrographic survey- Tides — MSL — Sounding methods — Three point problem — River surveys — Measurement of current and discharge – Mine surveying Equipment – Weisbach triangle – Tunnel alignment andsetting out – Transfer of azimuth – Gyro Theodolite – Shafts and audits - Cadastral survey- Legal– Real – Taxcadastre – Land record system – Settlement procedure – deformation studies.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 2012
2. Satheesh Gopi, rasathishkumar, N.madhu, ── Advanced Surveying , Total Station GPSand Remote Sensing ── Pearson education , 2017 ISBN: 9789352860722, 9352860721

REFERENCES:

1. R.Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2017.
2. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1993.
3. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin, 2003.
4. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE654PT	Semester	VI			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	GROUND IMPROVEMENT TECHNIQUES		3	0	0	3

COURSE OBJECTIVES:

- Students will be exposed to various problems associated with soil deposits and methods to evaluate.
- To gain knowledge of different techniques to improve the characteristics of difficult soils.

PREREQUISITE:

- Basic Applied of soil mechanics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C654. 1	***Identify*** methods and selection of ground improvement techniques	K2
C654. 2	***Understand*** dewatering techniques and design for simple cases.	K2
C654. 3	***Apply*** knowledge on insitu treatment of cohesion less and cohesive soils	K2
C654. 4	***Understand*** the concept of earth reinforcement and design of reinforced earth.	K2
C654. 5	***Classify*** the types of grouts and grouting technique.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C654. 1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C654. 2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C654. 3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C654. 4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C654. 5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES WAVE **9**

Role of ground improvement in foundation engineering – Methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT II DEWATERING **9**

Dewatering Techniques – Well points – Vacuum and electroosmotic methods – Seepage analysis for two dimensional flows for fully and partially penetrated slots in homogeneous deposits – Design for simple cases.

UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOIL **9**

Insitu densification of cohesionless soils – Shallow as deep compaction – Dynamic compaction - Vibroflotation, Sand compaction piles and deep compaction. Consolidation of cohesionless soils - Preloading with sand drains, and fabric drains, Stabilization of soft clay ground using stone columns and Lime piles-Installation techniques – Simple design – Relative merits of above methods and their limitations.

UNIT IV EARTH REINFORCEMENT **9**

Types of reinforcement material – Reinforced earth wall – Mechanism – Simple design Applications of reinforced earth; Functions of Geosynthetics in filtration, drainage, separation, road works and containment applications.

UNIT V GROUTING TECHNIQUES **9**

Types of grouts – Grouting equipments and machinery – Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals – Stabilization of expansive soil.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Hausmann, M.R "Engineering principles of Ground Modifications", Tata McGraw-Hill publications, 2017.
2. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012

REFERENCES:

1. Xianthakos, Abreimson and Bruce – Ground Control and Improvement, John Wiley and Sons, 2010.
2. K. Krisch and F. Krisch (2010) – Ground Improvement by Deep Vibratory Methods, Spon Press, Taylor and Francis
3. Koerner, R. M (2011) – Designing with Geosynthetics – Prentice Hall, New Jersey

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE655PT	Semester	VI			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	URBAN PLANNING AND DEVELOPMENT		3	0	0	3

COURSE OBJECTIVES:

- To introduce the history of town planning and its importance
- To study the various steps involved in urban planning and to know the housing development schemes
- To learn the planning and management of different infrastructure facilities in a city
- To understand the importance of public transport and non-motorized transport for a sustainable city development
- To know the importance of protecting the environment and natural resources in a city
- To introduce the concept of smart cities in India

PREREQUISITE:

- Basic Knowledge on streets, roads, towns and cities.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C655.1	***Describe*** basic issues in urban planning	K2
C655.2	***Develop*** plans for urban and rural development	K2
C655.3	***Identify*** socio economic aspects of urban and rural planning	K2
C655.4	***Design*** of urban development projects.	K2
C655.5	***Build*** urban development systems.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C655.1	2	1	-	-	-	1	1	-	-	-	1	1	2	1
C655.2	2	1	-	-	-	1	1	-	-	-	1	1	2	1
C655.3	2	2	-	-	-	1	1	-	-	-	1	1	2	2
C655.4	3	3	2	-	-	1	1	-	-	-	1	1	3	3
C655.5	3	2	-	-	-	1	1	-	-	-	1	1	3	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I BASIC ISSUES **8**

Definition of Human settlement, Urban area, Town, City, Urbanization, Suburbanization, Urban sprawl, Peri - urban areas, Central Business District (CBD), Classification of urban areas – Trend of Urbanization at International, National, Regional and State level.

UNIT II PLANNING PROCESS **8**

Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas, Surveys and Questionnaire Design.

UNIT III DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION **10**

Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights, Special Economic Zones- Development of small town, smart cities and satellite city-case studies.

UNIT IV PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS **9**

Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.

UNIT V LEGISLATION, DEVELOPMENTAND MANAGEMENT OF URBAN SYSTEM **10**

Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Durganand Balsavar, Mahindra World City, Public Private Partnerships in Urban Planning, Mapin Publishers, (2012).
2. Eddie N. Laboy-Nieves, Fred C. Schaffner, Ahmed Abdelhadi, Mattheus F.A. Goosen. Environmental Management, Sustainable Development and Human Health. CRC Press, Taylor & Francis, (2008).

REFERENCES:

1. Peter Hall, Mark Tewdwr-Jones, Urban and Regional Planning. Taylor & Francis, (2010).
2. Randall Crane and Rachel Weber, The Oxford Handbook of Urban Planning. Oxford University Press, (2012).
3. Carol L. Stimmel, Building Smart Cities: Analytics, ICT, and Design Thinking. CRC Press, Taylor & Francis, (2015)
4. Joy Sen., Sustainable Urban Planning. The Energy and Resources Institute, New Delhi, India, (2013).

VII SEMESTER

SEMESTER VII										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21CE71T	Estimation, Costing and Valuation Engineering	PCC	40	60	100	3	0	0	3
2	21CE72T	Construction Management	PCC	40	60	100	3	0	0	3
3	21CE73T	Structural Design and Drafting	PCC	40	60	100	3	1	0	4
4	21CE74T	Prestressed Concrete Structures	PCC	40	60	100	3	0	0	3
5	-	Professional Elective - II	PEC	40	60	100	3	0	0	3
6	-	Professional Elective - III	PEC	40	60	100	3	0	0	3
PRACTICAL										
7	21EE05P	Project Phase - I	PROJ	60	40	100	0	0	4	2
8	21EE04P	Internship	EEC	-	100	100	0	0	0	1
TOTAL										**22**

LIST OF PROFESSIONAL ELECTIVE COURSES

S. No	COURSE CODE	COURSE TITLE
Professional Elective-II		
1	21CE751PT	Housing Planning and Management
2	21CE752PT	Bridge Engineering
3	21CE753PT	Finite Element Methods
4	21CE754PT	Building Planning and Drawing
5	21CE755PT	Structural Dynamics and Earthquake Engineering
Professional Elective-III		
1	21CE761PT	Ground water Engineering
2	21CE762PT	Engineering Hydrology
3	21CE766PT	Industrial Project Planning
4	21CE764PT	Pre Fabricated Structures
5	21CE765PT	Green Concepts in Civil Engineering

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE71T	Semester	VII			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	ESTIMATION, COSTING AND VALUATION ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- The students will acquire knowledge in estimation, tender practices, contract procedures, and valuation and will be able to prepare estimates, call for tenders and execute works.

PREREQUISITE:

- Knowledge on Surveying.
- Knowledge on Concrete Technology.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C701. 1	***Estimate*** the quantities for buildings	K3
C701. 2	***Analyze*** for all Building works, canals, and Roads and Cost Estimate.	K3
C701. 3	***Understand*** types of specifications, principles for report preparation, tender notices types.	K2
C701. 4	***Classify*** the types of contracts.	K2
C701. 5	***Evaluate*** the cost of land and buildings.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C701. 1	3	2	1	-	-	-	-	-	-	-	-	-	2	1
C701. 2	3	2	1	-	-	-	-	-	-	-	-	-	2	1
C701. 3	3	2	1	-	-	-	-	-	-	-	-	-	2	1
C701. 4	3	2	1	-	-	-	-	-	-	-	-	-	2	1
C701. 5	3	2	1	-	-	-	-	-	-	-	-	-	2	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I QUANTITY ESTIMATION **9**

Philosophy – Purpose – Methods of estimation – Types of estimates – Approximate estimates – Detailed estimate – Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining walls – culverts (additional practice in class room using computer softwares).

UNIT II RATE ANALYSIS AND COSTING **9**

Standard Data – Observed Data – Schedule of rates – Market rates – Standard Data for Man Hours and Machineries for common civil works – Rate Analysis for all Building works, canals, and Roads– Cost Estimates (additional practice in class room using Computer soft ware's) - (Analysis of rates for the item of work asked, the data regarding labour, rates of material and rates of labour to be given in the Examination Question Paper).

UNIT III SPECIFICATIONS, REPORTS AND TENDERS **9**

Specifications – Detailed and general specifications – Constructions – Sources – Types of specifications – Principles for report preparation – report on estimate of residential building – Culvert – Roads – TTT Act 2000 – Tender notices – types – tender procedures – Drafting model tenders , E-tendering-Digital signature certificates- Encrypting -Decrypting – Reverse auctions.

UNIT IV CONTRACTS **9**

Contract – Types of contracts – Formation of contract – Contract conditions – Contract for labour, material, design, construction – Drafting of contract documents based on IBRD / MORTH Standard bidding documents – Construction contracts – Contract problems – Arbitration and legal requirements.

UNIT V VALUATION **9**

Definitions – Various types of valuations – Valuation methods - Necessity – Capitalised value – Depreciation – Escalation – Valuation of land – Buildings – Calculation of Standard rent – Mortgage – Lease.

TOTAL: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. B.N Dutta 'Estimating and Costing in Civil Engineering', UBS Publishers & Distributors (P) Ltd, 2010.
2. B.S.Patil, 'Civil Engineering Contracts and Estimates', University Press, 2006
3. D.N. Banerjee, 'Principles and Practices of Valuation', V Edition, Eastern Law House, 1998.

REFERENCES:

1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD.
2. Tamil Nadu Transparencies in Tenders Act, 1998.
3. Arbitration and Conciliation Act, 1996.
4. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE72T	Semester	VII			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	CONSTRUCTION MANAGEMENT		3	0	0	3

COURSE OBJECTIVES:

- At the end of this course the student is expected to have learnt how to plan construction projects, schedule the activities using network diagrams, determine the cost of the project, control the cost of the project by creating cash flows and budgeting and how to use the project information as an information and decision making tool.

PREREQUISITE:

- Fundamentals of construction materials

COURSE OUTCOMES:

CO. No.	Course Outcomes	Bloom Level
On successful completion of this course, students will be able to		
C702.1	***Understand*** basic concepts of construction management.	K2
C702.2	***Planning*** and organizing construction project	K3
C702.3	***Outline*** to control the cost in a construction and the process of construction	K2
C702.4	***Understand*** the quality control and safety during construction.	K2
C702.5	***Organize*** information in in risk Management systems. .	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C702.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C702.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C702.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C702.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C702.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note:1: Slight, 2: Moderate,3:Substantial

SYLLABUS: **No. of Credits: 3**

UNIT I FUNDAMENTALS OF CONSTRUCTION MANAGEMENT 9

Introduction of construction Project Management – Construction Scope – Construction Project Characteristics - Project development and Life Cycle – Construction Project Management Practice -Roles and Functions and Responsibility of Construction Managers and Major causes of Project failure.

UNIT II PLANNING AND ORGANIZING CONSTRUCTION PROJECT 9

Construction Project organization – Planning Project work Scope and integration Processes - Defining Project Activities - Scheduling Project - CPM, PERT, Precedence Network Analysis – Planning and organizing project resources such as manpower, material, equipment, Time and cost for construction site**.**

UNIT III DESIGN AND CONSTRUCTION PROCESS 9

Design and Construction as an Integrated System – Innovation, Economic and Technological Feasibility - Design Methodology - Functional Design - Construction Site Environment – Case Studies - Project Clearance requirement, Procedure and Necessary Documentation for Major Works Like Dams, Multi-storeyed Structures, Ports, Tunnels – Costing and Cost Control techniques.

UNIT IV PROJECT RESOURCES UTILIZATION 9

Labour productivity variations, productivity improvement - work study - Materials purchase & inventory control - Construction Equipment - Choice of Equipment and Standard Production Rates –Time management and Cost management - Measuring project progress & performance – Tools and Techniques.

UNIT V RISK MANAGEMENT AND PROJECT CONTROLLING 9

Risks management in construction site - Controlling resource productivity – Schedule and Cost Controlling system – Earned value management system – Project Management Information system using softwares (Ms Projects) - Synchronizing Schedules and Resources (Primavera)

TOTAL: 45 Periods

LEARNING RESOURECES:

TEXT BOOKS:

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Srinath,L.S., “PERT and CPM Priniples and Applications “, Affiliated East West Press, 2001

REFERENCES:

1. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.
2. Moder.J., C.Phillips and Davis, “Project Management with CPM”, PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1983
3. Halpin,D.W., “Financial and cost concepts for construction Management”, John Wiley and Sons, New York, 1985

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE73T	Semester	VII			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	STRUCTURAL DESIGN AND DRAFTING		3	1	0	4

COURSE OBJECTIVES:

- This course aims at providing students with a solid background on the principles of structural engineering design.
- Students will be acquire the knowledge of liquid retaining structures, bridges components, retaining wall and industrial structures

PREREQUISITE:

- Design of steel structures and Design of Reinforced Cement Concrete Elements

COURSEOUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C703.1	***Design*** and draw reinforced concrete Cantilever and Counter fort Retaining Walls	K3
C703.2	***Design*** and draw flat slab as per code provisions	K3
C703.3	***Design*** and draw reinforced concrete and steel bridges	K3
C703.4	***Design*** and draw reinforced concrete and steel water tanks	K3
C703.5	***Design*** and detail the various steel trusses and gantry girders	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C703.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C703.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C703.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C703.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C703.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: - 1: Slight; 2: Moderate; 3 Substantial

SYLLABUS **No. of Credits: 4**

UNIT I RETAINING WALLS 6

Reinforced concrete Cantilever and Counter fort Retaining Walls– Horizontal Backfill with Surcharge–Design of Shear Key-Design and Drawing.

UNIT II FLAT SLAB and BRIDGES 6

Design of Flat Slabs with and without drops by Direct Design Method of IS code- Design and Drawing - IRC Specifications and Loading – RC Solid Slab Bridge – Steel Foot- Over Bridge- Design and Drawing.

UNIT III LIQUID STORAGE STRUCTURES 6

RCC Water Tanks - On ground, Elevated Circular, underground Rectangular Tanks– Hemispherical Bottomed Steel Water Tank –-Design and Drawing.

UNIT IV INDUSTRIAL STRUCTURES 6

Structural steel Framing - Steel Roof Trusses – Roofing Elements – Beam columns – Codal provisions - Design and Drawing.

UNIT V GIRDERS AND CONNECTIONS 6

Plate Girders – Behaviour of Components-Deign of Welded Plate Girder-Design of Industrial Gantry Girders – Design of Eccentric Shear and Moment Resisting connections.

TOTAL: 30 PERIODS

List of Exercises for Design and Drawing

Part A - RCC Structures

1. Rectangular Column and Footing
2. Combined footing with Two columns
3. RCC one way &Two way Slab and beam system
4. Cantilever Retaining wall
5. RCC T beam bridge deck
6. Underground Rectangular Water Tank
7. Elevated circular water Tank

Part B- Steel Structures

1. Built up column, column base and Foundation
2. Simple Steel Roof Trusses
3. Industrial building Elements
4. Plate Girder (welded)
5. Framed Connections and Detailing
6. Gantry girder
7. Steel water Tank.

TOTAL: 30 PERIODS

LEARNING RESOURCES:

TEXT BOOKS:

1. Krishnaraju N, Structural Design and Drawing, Universities Press, 2009
2. Punmia B.C, Ashok Kumar Jain and Arun KumarJain, Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

REFERENCES:

1. Krishnamurthy D,Structural Design and Drawing VolI,IIandIII,CBS Publishers, 2010.
2. Shah V L and Veena Gore,Limit State Design of Steel Structures
3. IS800-2007, Structures Publications, 2009.
4. IS 456(2000) Indian Standard Plain and Reinforced Concrete-Code of Practice, Bureau of Indian Standards, New Delhi.
5. SP34 Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi.
6. IS 800 (2007) Indian Standard General Construction In Steel—Code of Practice, Bureau of Indian Standards, New Delhi.
7. IS 875 Part 1 (2003) Code of Practice for Design Loads (Other Than Earthquake) for
8. Buildings and Structures, Code of Practice-Dead Load, Bureau of Indian Standards, New Delhi.
9. IS 875 Part 2 (2003) Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, Code of Practice-Imposed Load, Bureau of Indian Standards, New Delhi.
10. IS 3370 Part 1 (2009) Indian Standard Concrete Structures for Storage of Liquids-Code of Practice–General Requirements, Code of Practice, Bureau of Indian Standards, New Delhi.
11. IS 3370–Part 4 (2008) Indian Standard Code of Practice for Concrete Structures for The Storage of Liquids-Design Tables, Code of Practice, Bureau of Indian Standards, New Delhi.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE74T	Semester	VII			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	PRESTRESSED CONCRETE STRUCTURES		3	0	0	3

COURSE OBJECTIVES:

- To introduce the need for pre-stressing as well as the methods, types and advantages of Pre-stressing to the students.
- Students will be introduced to the design of pre-stressed concrete structures subjected to flexure and shear.

PREREQUISITE:

- Design of steel structures and Design of Reinforced Cement Concrete Elements

COURSE OUTCOMES:

CO No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C704.1	***Understand*** the behavior of pre-stressed concrete members and able to analyze the pre-stressed concrete beams.	K2
C704.2	***Design*** the pre-stressed concrete members for flexure and shear as per the relevant design code (IS 1343).	K3
C704.3	***Analyze*** for deflection of pre-stressed concrete members and design the anchorage zone.	K3
C704.4	***Analyze*** and design of composite beams and continuous beams.	K3
C704.5	***Design*** of pre-stressed concrete structures – Tanks, pipes and poles.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C704.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C704.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C704.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C704.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C704.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: - 1: Slight; 2: Moderate; 3 Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9

Basic concepts – Advantages – Materials required – Systems and methods of pre-stressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections

UNIT II DESIGN FOR FLEXURE AND SHEAR 9

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE 9

Factors influencing deflections – Short term deflections of un-cracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and IS1343 code

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS 9

Analysis and design of composite beams – Methods of achieving continuity in continuous beams Analysis for secondary moments – Concordant cable and linear transformation – Calculation of Stresses – Principles of design.

UNIT V MISCELLANEOUS STRUCTURES 9

Design of tension and compression members – Tanks, pipes and poles – Partial pre-stressing – Definition, methods of achieving partial pre-stressing, merits and demerits of partial pre-stressing.

TOTAL: 45 PERIODS

LEARNING RESOURCES:

TEXT BOOKS:

1. Krishna Raju N., "Pre-stressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
2. Pandit.G.S. and Gupta.S.P., "Pre-stressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012
3. Krishna Raju N., "Pre-stressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012.
4. T.Y. Lin and Ned H. Burns, 'Design of Prestressed Concrete Structures'' Wiley Publishers, 2020.

REFERENCES:

1. Rajagopalan.N, "Pre-stressed Concrete", Narosa Publishing House, 2002.
2. Dayaratnam.P., "Pre-stressed Concrete Structures", Oxford and IBH, 2013.
3. IS1343:2012, Code of Practice for Pre-stressed Concrete, Bureau of Indian Standards

LIST OF PROFESSIONAL ELECTIVE COURSES

S. No	COURSE CODE	COURSE TITLE
Professional Elective-II		
1	21CE751PT	Housing Planning and Management
2	21CE752PT	Bridge Engineering
3	21CE753PT	Finite Element Methods
4	21CE754PT	Building Planning and Drawing
5	21CE755PT	Structural Dynamics and Earthquake Engineering

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE751PT	Semester	VII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	HOUSING PLANNING AND MANAGEMENT		3	0	0	3

COURSE OBJECTIVES:

- To create knowledge for the students to have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.
- The course focuses on cost effective construction materials and methods. Emphasis is given on the principles of sustainable housing policies and programmes.

PREREQUISITE:

- Fundamentals of planning, design and evaluation in construction.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Bloom Level
On successful completion of this course, students will be able to		
C751.1	***Understand*** basic concepts of planning.	K3
C751.2	***Apply*** information system on various housing projects.	K3
C751.3	***Plan*** and design the housing projects.	K3
C751.4	***Apply*** new construction techniques with cost effective modern materials.	K3
C751.5	***Evaluate*** housing projects.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C751.1	1	-	-	-	-	-	-	-	-	-	-	--	-	-
C751.2	-	2	-	-	-	-	-	-	-	-	-	-	-	-
C751.3	-	2	-	-	-	-	-	-	-	-	-	-	-	-
C751.4	-	-	1	-	-	-	-	-	-	-	-	-	-	-
C751.5	1	-	-	-	-	-	-	-	-	-	-	--	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits:3**

UNIT I INTRODUCTION TO HOUSING 10

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels.

UNIT II HOUSING PROGRAMMES 10

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods'- Plotted l and development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies, and Private sector in supply, quality, infrastructure and pricing–Role of Non- Governmental organization and slum housing

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Land Use and Soil suitability analysis -Building Byelaws and Rules and Development Control Regulations - Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing Project Formulation

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 8

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction- Green building concepts – Building centres – Concepts, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 8

Evaluation of Housing Projects for sustainable principles – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy- Public Private Partnership Projects – Viability Gap Funding - Pricing o f Housing Units (Problems).

TOTAL: 45 Periods

LEARNING RESOURECES:

TEXT BOOKS:

1. Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 2000.
2. Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 2001.

REFERENCES:

1. Wiley- Blackwell, "Neufert Architects" Data, 4 th Edition, Blackwell Publishing Ltd, 2012
2. Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design",8th Edition, Tata McGraw Hill Edition, 2011
3. Walter Martin Hosack, "Land Development Calculations", McGraw Hill 2nd Edition, USA 2010
4. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004.
5. Government of India, National Housing Policy, 2004.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE752PT	Semester	VII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	BRIDGE ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- To make the student to know about various bridge structures, selection of appropriate bridge structures and its design for given site conditions.

PREREQUISITE:

- Knowledge on Highway Engineering.
- Knowledge on Concrete Technology.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C752. 1	***Identify*** loads on bridges and selection of type of bridge for the site condition.	K3
C752. 2	***Analyze*** the super structure by various methods.	K4
C752. 3	***Design*** the trussed bridge and plate girder bridges	K4
C752. 4	***Design*** reinforced concrete slab and T beam bridges and pre-stressed concrete bridges.	K4
C752. 5	***Decide*** the appropriate sub structural systems, bearings and expansion joints for the bridges.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES ANDP ROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C752. 1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C752. 2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C752. 3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C752. 4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C752. 5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION **9**

History of bridges - Components of a bridge - Classification of road bridges - Selection of site and initial decision process - Survey and alignment; Geotechnical investigations and interpretations. River Bridge: Selection of Bridge site and planning - Collection of bridge design data - Hydrological calculation - Road Bridges - IRC codes - Standard Loading for Bridge Design - Influence lines for statically determinate and indeterminate structures - Transverse distribution of Live loads among deck longitudinal - Load combinations for different working state and limit state designs - Railway Bridges: Loadings for Railway Bridges; Railroad data. Pre-design considerations - Railroad vs Highway bridges.

UNIT II SUPERSTRUCTURES **9**

Bridge decks – Structural forms and behaviour – Choices of superstructure types – Behaviour and modelling of bridge decks – Simple beam model – Plate model – Grillage method – Finite Element method - Different types of superstructure (RCC and PSC); Longitudinal Analysis of Bridge.-Transverse Analysis of Bridge - Temperature Analysis - Distortional Analysis - Effects of Differential settlement of supports - Reinforced earth structures.

UNIT III DESIGN OF STEEL BRIDGES **9**

Design of Truss Bridges – Design of Plate girder bridges.

UNIT IV DESIGN OF RC BRIDGES **9**

Design of slab bridges – T beam bridges.

UNIT V SUBSTRUCTURE, BEARINGS AND EXPANSION JOINTS, PARAPETS AND RAILINGS **9**

Substructure - Pier; Abutment - Wing walls- Importance of Soil-Structure Interaction - Types of foundations - Open foundation- Pile foundation- Well foundation- Simply supported bridge- Continuous Bridge - Bearings and Expansion Joints - Different types of bridge bearings and expansion joints - Parapets and Railings for Highway Bridges

TOTAL: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Johnson Victor D., “Essentials of Bridge Engineering”, Oxford and IBH Publishing Co., New Delhi, 2009.
2. Jagadeesh. T.R. and Jayaram. M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013.

REFERENCES:

1. Phatak D.R., “Bridge Engineering”, Satya Prakashan, New Delhi, 2018.
2. Ponnuswamy S., “Bridge Engineering”, Tata McGraw-Hill, New Delhi, 2019.
3. Rajagopalan. N. “Bridge Superstructure”, Alpha Science International, 2018.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE753PT	Semester	VII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	FINITE ELEMENT METHODS		3	0	0	3

COURSE OBJECTIVES:

- To study the basics of the Finite Element Technique, a numerical tool for the solution of different classes of problem

PREREQUISITE:

- Analysis of structures I & II

COURSE OUTCOMES:

CO. No.	Course Outcomes	Bloom Level
On successful completion of this course, students will be able to		
C753.1	***Develop*** shape functions and stiffness matrices for spring and bar elements	K3
C753.2	***Develop*** global stiffness matrices and global load vectors	K3
C753.3	***Apply*** natural and aerial coordinate systems	K3
C753.4	***Analyze*** planar structural systems using finite element modelling	K3
C753.5	***Understand*** the recent software technologies	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C753.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C753.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C753.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C753.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C753.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3:Substantial

SYLLABUS: **No. of Credits: 3**

UNIT I INTRODUCTION **9**

Field Conditions, Boundary Conditions- Functional Approximation - Finite Differences Method Development of Finite Element Method.

UNIT II ELEMENT PROPERTIES **9**

Displacement Models, Relation Between The Nodal Degrees Of Freedom And Generalized Coordinates - Convergence Requirements, Natural Co-Ordinate Systems - Shape Functions, Element Strains And Stresses - Development Of Element Stiffness - Matrix And Equivalent Nodal Loads, Static Condensation.

UNIT III ISOPARAMETRIC ELEMENT **9**

Iso-parametric, Super-Parametric And Sub-Parametric Elements - Computation Of Stiffness Matrix Of Iso-parametric Elements - Convergence Criteria For Iso-parametric Elements - Numerical Integration Technique Using Gauss Quadrature.

UNIT IV ELEMENTS AND ANALYSIS **9**

Truss Element, Analysis Of Plane Truss Problem, Hermitian Beam Element - Beam On Elastic Foundation, Solution Of Beam Problem - Triangular Elements, Rectangular Elements, Isoperimetric Elements - Patch Test, Axisymmetric Solid Element - Displacement Functions, Plate Ending Elements - Reduced Integration, Stress Smoothing Technique

UNIT V HEAT TRANSFER, MATRIX AND SOFTWARE ANALYSIS **9**

Formulation Of Finite Element Method For Heat Conduction, Various Weighted Residual Techniques - One Dimensional Heat Conduction, Two Dimensional Conduction Heat Transfer - Assemblage Of Elements, Direct Stiffness Method - Boundary Conditions And Reactions - Gauss Elimination And Matrix Decomposition - Pre-And Post-Processors Finite Element Analysis Software - Error Estimates And Adaptive Meshing

TOTAL: 45 PERIODS

LEARNING RESOURECES:

TEXT BOOKS:

1. Krishnamurthy, C.S., 'Finite Element Analysis-Theory and Programming', TMH Pub. N.Delhi. 2000.
2. Cook, R.D., Malkus, D.S. and Plesha, M.E., 'Concept and Applications of Finite Element Analysis', John Wiley & Sons, New York, 2001.
3. ManickaSelva m,V.K., 'Finite Element Primer', Dhanpat Rai Publications, 2002.

REFERENCES:

1. Desai, C.S. and Abel, J.F., 'Introduction to the Finite Element Method', Affiliated East-West Press Pvt. Ltd. N.Delhi, 2000.
2. Bhavikatti.S.S, “Finite Element Analysis”, New Age International Publishers, 2007.
3. Chandrupatla R.T. and Belegundu, A.D., “Introduction to Finite Elements in Engineering”, Prentice Hall of India, 2007.
4. Rao.S.S, “Finite Element Method in Engineering”, Butterworth – Heinmann, UK, 2008

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE754PT	Semester	VII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	BUILDING PLANNING AND DRAWING		3	0	0	3

COURSE OBJECTIVES:

- To apply the knowledge and idea in planning the buildings as per specifications
- To Understand the minimum building bye laws in planning the buildings
- To Prepare the site specification

PREREQUISITE:

- Analysis of structures I & II

COURSE OUTCOMES:

CO. No.	Course Outcomes	Bloom Level
On successful completion of this course, students will be able to		
C754.1	***Illustrate*** the orientation of buildings and its components	K3
C754.2	***Apply*** the knowledge and idea in planning residential buildings as per specifications	K3
C754.3	***Apply*** the knowledge and idea in planning public buildings as per specifications	K3
C754.4	***Understand*** the minimum building bye laws in planning the buildings	K2
C754.5	***Prepare*** the site specification and documentation records	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C754.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C754.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C754.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C754.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C754.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note:1 :Slight,2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I SITE AND BUILDING PLANNING **9**

Building and its basic terminologies - Site selection of building plot and its factors –- Climatic and its influence on building planning – Orientation of buildings – Orientation criteria for Indian conditions - Principles of planning and practical considerations – Components of building

UNIT II PLANNING OF RESIDENTIAL BUILDINGS **9**

Basic elements of planning residential buildings – Minimum sizes – Guidelines for the location and sizes of doors and windows - Specification of different building items – Vastu shastra for residential building - Preparing a line plan – Conversion of line plan into solid plan – Projection of elevation and sectional views – Detailed drawing of various residential building.

UNIT III PLANNING OF PUBLIC BUILDINGS **9**

Basic elements of planning public buildings – Difference between residential and official buildings – Provisions in public buildings – bank, clinic, office and small factories and industries – Vastu Shastra for office, industry, shops / showrooms and commercial complex – Detailed drawing of various public buildings.

UNIT IV BUILDING BYE-LAWS **9**

Building bye-laws – Objectives and principles of bye-laws – Minimum plot size and building frontage – open spaces – Minimum standard dimensions on building elements – Provisions for lighting, ventilation, drainage and sanitation – Requirements for off street parking – Requirements for green belt and landscaping – Sizes of the structural elements – Applicability of bye-laws.

UNIT V SITE SPECIFICATIONS & DOCUMENTATION **9**

Construction specification – Importance and types of specification – Construction specification standards - Writing specifications for construction activities - Construction documents - Types and contents of construction documents – documents and checklist for residential and industrial building plan approval, clearance and completion.

TOTAL: 45 PERIODS

LEARNING RESOURECES:

TEXT BOOKS:

1. V.B.Sikka, "A course in Civil Engineering Drawing" S.K. Kataria & Sons Publishers, Seventh Edition, 2015.
2. D.N.Ghose, "Civil Engineering Drawing and Design" CBS Publishers & Distributors Pvt.Ltd., 2nd Edition, 2010.
3. Dr. N. Kumara Swamy, A. Kameswara Rao. "Building Planning And Drawing" New Delhi, 3rd Edition, 2020.

REFERENCES:

1. National Building Code of India 2016 (NBC 2016)
2. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design (Third Edition), Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 3rd Edition, 2017.
3. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi, 2016

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE755PT	Semester	VII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- To understand the behavior of dynamic loading. Study the effect of earthquake loading on the behavior of structures. Understand the codal provisions to design the structures as earthquake resistant.

PREREQUISITE:

- NIL

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C755.1	***Develop*** knowledge in the simulation and mathematical model development.	K3
C755.2	***Identify***, formulate and solve complicated problem.	K3
C755.3	***Explain*** the role of natural calamity in the damage of structures.	K2
C755.4	***Develop*** the skill to analyze data and to apply the same in the practical problems.	K3
C755.5	***Apply*** the developed methodologies for the safe and stable design of structures.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C755.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C755.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C755.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C755.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C755.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: - 1: Slight; 2: Moderate; 3 Substantial

SYLLABUS **No. of Credits: 3**

UNIT I SINGLE DEGREE OF FREEDOM SYSTEM **9**

Definition of degree of freedom – Idealization of structure as Single Degree of Freedom (SDOF) system – Formulation of equation of motion for various SDOF system – D'Alemberts Principles – Effect of damping -Measurement of damping - Vibration measuring instruments– Free and forced vibration of damped and undammed structures – Response to harmonic forces and periodic forces.

UNIT II MULTI DEGREE OF FREEDOM SYSTEM **9**

Formulation of equation of motion for multi degree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Response to free and forced vibration of undammed and damped MDOF systems – Modal superposition methods.

UNIT III INTRODUCTION TO EARTHQUAKE ENGINEERING **9**

Elements of Engineering Seismology – Definitions, Introduction to Seismic hazard, Earthquake phenomenon – Seism tectonics – Seismic Instrumentation – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters.

UNIT IV EARTHQUAKE EFFECTS ON STRUCTURES **9**

Effect of earthquake on different types of structures – Behaviors of RCC, Steel and pre-stressed Concrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Evaluation of Earthquake forces – IS Code 1893: 2002 – Response Spectra – Lessons learnt from past earthquakes.

UNIT V CONCEPTS OF EARTHQUAKE RESISTANT DESIGN **9**

Causes of damage – Planning considerations/Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings – Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Lateral load analysis – Design and detailing (IS 13920:2008).

TOTAL: 45 PERIODS

LEARNING RESOURCES:

TEXT BOOKS:

1. Mario Paz, Structural Dynamics – Theory and Computations, Fourth Edition, CBS publishers, 2018.
2. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2007.

REFERENCES:

1. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, McGraw Hill International Edition, 2015.
2. Jai Krishna, Chandrasekaran.A.R. And Brijesh Chandra, Elements of Earthquake Engineering, South Asia Publishers, 2017.
3. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, McGraw – Hill Book Company, 2015
4. Humar.J.L, Dynamics of Structures, Prentice Hall Inc., 2018.
5. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2007.
6. Moorthy.C.V.R., Earthquake Tips, NICEE, IIT Kanpur, 2002.
   IS13920-1993 Ductile detailing of reinforced concrete structures subjected to seismic forces - Code of practice.
7. IS 1893 part 1 2002 Indian standard criteria for earthquake resistant design of structures.
8. IS 4326-1993 Earthquake Resistant Design and Construction of Buildings--Code of Practice

LIST OF PROFESSIONAL ELECTIVE COURSES

S. No	COURSE CODE	COURSE TITLE
Professional Elective-III		
1	21CE761PT	Ground water Engineering
2	21CE762PT	Engineering Hydrology
3	21CE766PT	Industrial Project Planning
4	21CE764PT	Pre Fabricated Structures
5	21CE765PT	Green Concepts in Civil Engineering

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE761PT	Semester	VII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	GROUND WATER ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers.
- To understand the techniques of development and management of groundwater.

PREREQUISITE:

- Knowledge on Water Supply Engineering & Irrigation Engineering and Water Management.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C761. 1	***Understand*** aquifer properties and its dynamics	K2
C761. 2	***Design*** and Construct wells	K3
C761. 3	***Develop*** a model for groundwater management	K3
C761. 4	***Understand*** the importance of artificial recharge and groundwater quality concepts	K2
C761. 5	***Develop*** knowledge on conservation of groundwater	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C761. 1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C761. 2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C761. 3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C761. 4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C761. 5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note:1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I HYDROGEOLOGICAL PARAMETERS 9

History of bridges - Components of a bridge - Classification of road bridges - Selection of site and initial decision process -Survey and alignment - Geotechnical investigations and interpretations. River Bridge - Selection of Bridge site and planning - Collection of bridge design data - Hydrological calculation - Road Bridges - IRC codes - Standard Loading for Bridge Design - Influence lines for statically determinate and indeterminate structures - Transverse distribution of Live loads among deck longitudinal - Load combinations for different working state and limit state designs - Railway Bridges: Loadings for Railway Bridges; Railroad data. Pre-design considerations - Railroad vs Highway bridges.

UNIT II WELL HYDRAULICS 9

Unsteady state flow - Jacob method – Chow's method – Law of Times –Recovery – Bailer method – Slug method - tests - Image well theory – Partial penetrations of wells – Well losses – Specific Capacity and Safe yield - Collector well and Infiltration gallery.

UNIT III GROUNDWATER MANAGEMENT 9

Need for Management Model – Database for Groundwater Management – Groundwater balance study – Introduction to Mathematical model – Model Conceptualization – Initial and Boundary Condition – Calibration – Validation – Future Prediction – Sensitivity Analysis – Uncertainty – Development of a model

UNIT IV GROUNDWATER QUALITY 9

Ground water chemistry - Origin, movement and quality - Water quality standards – Drinking water – Industrial water – Irrigation water - Ground water Pollution and legislation - Environmental Regulatory requirements of slab bridges – T beam bridges – PSC bridges

UNIT V GROUNDWATER CONSERVATION 9

Artificial recharge techniques – Reclaimed wastewater recharge – Soil aquifer treatment (SAT) – Aquifer Storage and Recovery (ASR) Seawater Intrusion and Remediation – Ground water Basin management and Conjunctive use – Protection zone delineation, Contamination source inventory and remediation schemes.

TOTAL: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

REFERENCES:

1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2012.
2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 2000.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE762PT	Semester	VII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	ENGINEERING HYDROLOGY		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall.

PREREQUISITE:

- Fluid mechanics, Applied Hydraulic Engineering, Irrigation Engineering and water management

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C762. 1	***Explain*** about the hydrologic cycle and hydrometeorology.	K3
C762. 2	***Outline*** the details on the formation of precipitation.	K2
C762. 3	***Apply*** the various methods of field measurements and empirical formulae for estimating the various losses of precipitation and stream flow	K3
C762. 4	***Apply*** the various methods of field measurements and empirical formulae for estimating the flood and flood routing.	K3
C762. 5	***Utilize*** and gain knowledge on groundwater and hydraulics of subsurface flows.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C762. 1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C762. 2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C762. 3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C762. 4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C762. 5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note:1: Slight, 2: Moderate, 3: Substantia

SYLLABUS **No. of Credits: 3**

UNIT I PRECIPITATION **9**

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

UNIT II ABSTRACTION FROM PRECIPITATION **9**

from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

UNIT III HYDROGRAPHS **9**

Factors affecting Hydrograph – Base flow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph

UNIT IV FLOODS AND FLOOD ROUTING **9**

Design flood estimation: PMF estimation-Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control

UNIT V GROUND WATER HYDROLOGY **9**

Types of aquifers – Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

TOTAL: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Subramanya, K., "Engineering Hydrology", Tata McGraw Hill Publishing Co., Ltd., 2004
2. Raghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2022
3. Jayarami Reddy .P. Hydrology, Tata McGraw Hill, 2008.
4. Madan Mohan das and Mimi Das Saikia, Hydrology, Prentice Hall of India, 2013

REFERENCES:

1. Chow, V.T. and Maidment D.R. , "Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000
2. Singh, V.P., "Hydrology", McGraw Hill Inc., Ltd., 2016.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE766PT	Semester	VII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	INDUSTRIAL PROJECT PLANNING		3	0	0	3

COURSE OBJECTIVES:

- To develop the highly essential industry oriented skills and competencies.
- To provide opportunities for interdisciplinary work in tackling problems likely to be faced by them in industry which are exciting and challenging.

PREREQUISITE:

- Basic Fundamentals of Industrial Management.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C763. 1	***Identify*** the problem/task specification in existing systems related to the occupation	K3
C763. 2	***Select*** collect and use required information/knowledge to solve the problem/complete the task.	K3
C763. 3	***Choose*** relevant possible solution	K3
C763. 4	***Outline*** the ethical issues related to the project	K2
C763. 5	***Build*** the impact of the project on society	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C763. 1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C763. 2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C763. 3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C763. 4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C763. 5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note:1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I PLANNING THE PROJECT **9**

Project Planning - Developing a Mission, vision, goals and objectives of the project - Owners and stake holder - The work Breakdown Structure (WBS) to plan a project.

UNIT II TIME AND COST MANAGEMENT **9**

Estimation of Time, Costs and Resources – Scheduling Project works – Critical Path Method (CPM) – Assignment Resources to tasks – Resource balancing - Analysis and reports using Software tools (Microsoft Projects).

UNIT III THE PROJECT RISK PLAN **9**

Defining Project Risks – Process to establish the project risk plan – Contingency Reserves – Coordination points - Risk matrix Analysis – Project Control and Evaluation – The Change Control Process - Project Control using Earned Value Analysis.

UNIT IV PROJECT AS AN INDEPENDENT ACTIVITY IN THE COMPANY **9**

Project Performance – Project Integration into the Finance Planning of the Company – Post-project Value – Multi-project value.

UNIT V PLANNING TOOLS AND SOFTWARE **9**

Gnat Charts – Work Breakdown structure – Project Network Diagram – Kanban Boards – Risk Matrix – Timesheets – Project Dashboards – Project reports – Agile project Management - PERT – Critical Path Method(CPM) - Cost Benefit Analysis – Earned value Management - Stakeholder Mapping.

TOTAL: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. J.Heagney.:"Fundamentals of project Management" (2011)
2. Louis J. Goodman.:"Project Planning and Management"(2018).
3. Er. Kundan Singh and Dr. M.L. Kansal.:"Project Planning and Management with CPM and PERT'

REFERENCES:

1. H.Kerzner. Project Management: a Systems Approach to Planning, Scheduling and Controlling. John Wiley & Sons, 2006.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE764PT	Semester	VII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	PRE FABRICATED STRUCTURES		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge to students on modular construction industrialised construction and design of prefabricated elements and construction methods.

PREREQUISITE:

- Construction Materials, Steel Structures, Design of Reinforced Concrete Elements.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C764. 1	***Understand*** about design principles, layout of factory and stages of loading in precast construction.	K2
C764. 2	***Design*** prefabricated structural components.	K3
C764. 3	***Understand*** about types of floor systems, stairs and roofs used in precast construction.	K3
C764. 4	***Apply*** knowledge about types of walls used in precast construction, sealants, design of joints.	K3
C764. 5	***Design*** prefabricated structures for abnormal loads.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C764. 1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C764. 2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C764. 3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C764. 4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C764. 5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note:1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION **9**

Need for prefabrication – Principles of prefabrication – Modular coordination – Standardization – Materials – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS **9**

Behaviour and Types of Structural Components – Large Panel Systems – Roof and Floor Slabs – Wall Panels – Beams – Columns – Shear Walls.

UNIT III DESIGN PRINCIPLES **9**

Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems.

UNIT IV JOINTS AND CONNECTIONSIN STRUCTURAL MEMBERS **9**

Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction, contraction, expansion. Design of expansion joints – Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT V DESIGN FOR ABNORMAL LOADS **9**

Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc.,- Importance of avoidance of progressive collapse.

TOTAL: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Bruggeling A.S. GandHuyghe G.F."Prefabrication with Concrete", A.A. Balkema Publishers, USA, 2000.
2. Lewitt, M. "Precast Concrete-Materials, Manufacture, Properties and Usage", Applied Science Publishers, London And New Jersey,1999.
3. Bachmann, H. and Steinle, A."Precast Concrete Structures", Ernst & Sohn, Berlin, 2011.

REFERENCES:

1. Koncz T.,"Manual of precast concrete construction", Vol.I, II and III, Bauverlag, GMBH,1996.
2. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
3. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE765PT	Semester	VII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	GREEN CONCEPTS IN CIVIL ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- To imbibe basics of green design and sustainable development concept.
- To identify various area of implementing strategies for green design in projects to enhance built environment.
- To learn institutional guidelines for development and certification of green designs

PREREQUISITE:

- Fundamentals of Environmental Engineering

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C765. 1	***Demonstrate*** green concept skills and apply tools of Green building assessment.	K3
C765. 2	***Explain*** appropriate green building material and technique	K2
C765. 3	***Construct sustainable*** and energy efficient civil engineering projects	K3
C765. 4	***Apply*** Green Building rating using IGBC guidelines	K3
C765. 5	***Adopt*** sustainable architecture and design	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C765. 1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C765. 2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C765. 3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C765. 4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C765. 5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note:1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I GREEN BUILDING CONCEPT **9**

Overview of Green Building Movement - Concept of Green building and Sustainable development. Issues and Strategies of Green building and sustainable development-Objectives Principals and Benefits of Green building design-Introduction to High performance building-integrated design process of high performance building-Green project requirements and strategies-Overview of various green rating systems worldwide

UNIT II GREEN BUILDING MATERIALS AND INDOOR ENVIRONMENT QUALITY **9**

Introduction - Low emitting materials - Building and material reuse - Construction waste management - Regional materials - Life cycle cost assessment of building materials and products - Factors affecting indoor environment quality - Ventilation and filtration - Building materials and finishes - Remittance level - Indoor Environment quality best practice.

UNIT III WATER: REDUCE, REUSE AND RECYCLE **9**

Introduction - Waste water strategy and water reuse/recycling - Water fixtures and water use reduction strategies.

UNIT IV ENERGY EFFICIENT DESIGNS **9**

Passive cooling and day lighting - Active solar and photovoltaic - Building energy analysis methods - Building energy simulation- Building energy efficiency standards - Lighting system design - Lighting economics and aesthetics - Impacts of lighting efficiency - Energy audit and energy targeting Technological options for energy management.

UNIT V IGBC GUIDELINES **9**

Introduction - IGBC green new building Rating system – Overview and process – project checklist - Sustainable architecture and design - Site selection and planning - Water conservation and energy efficiency - Building materials and resources - Indoor Environment quality - Innovation and development

TOTAL: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Sam Kubba, “Hand book of Green building Design and construction”, Elsevier Architecture Press2016
2. Abe Kruger and Carl Seville, “Green building: principals and practice in residential construction”, Cengage Learning, 2000.

REFERENCES:

1. IGBC Green New building rating system (Version 3.0), March 2015.
2. GRIHA Manual Volume-1: Introduction to National Rating System by Ministry of New and Renewable Energy,2021
3. Government of India and the energy and resource institute, New Delhi, 1999.
4. Kibert, C. “Sustainable Construction: Green Building Design and Delivery”, John Wiley & Sons, 2008.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21EE05P	Semester	VII			
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)		L	T	P	C
Course Title	PROJECT PHASE - I		0	0	4	2

COURSE OBJECTIVES:

- The objective of the project is to make use of the knowledge gained by the student at various stages of the degree course.

PREREQUISITE:

- Strength of Materials I & II, Surveying Instruments & Measuring, Analysis of Structures I & II, Design of Reinforced Concrete Elements, Design of Steel Structures, Structural Design & Drafting, Concrete Technology, Waster Supply Engineering, Waste Water Engineering, Highway Engineering, Construction Management & Estimation, Costing & Valuation Engineering

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C707.1	***Apply*** the fundamental concept learnt during the theory courses to solve industrial problems	K3
C707.2	***Analyse*** the current status based on the information available in the literature or data obtained in the laboratory/ industry	K4
C707.3	***Develop*** material and energy balance for deisgn calculations	K3
C707.4	***Design*** of structural members	K3
C707.5	***Inspect*** the economics of a process through cost estimation	K4
C707.6	***Identify*** industrial problem, design process to carry out the process in an economically feasible way	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C707.1	3	3	2	2	3	3	3	3	3	3	2	2	2	2	2
C707.2	2	2	3	3	3	2	3	2	3	3	3	3	2	2	3
C707.3	3	3	3	2	3	3	2	3	3	2	3	3	3	3	3
C707.4	3	3	3	3	3	2	2	3	3	3	2	2	3	3	3
C707.5	3	3	3	3	3	3	3	3	2	2	3	3	2	3	3
C707.6	2	2	3	2	2	2	2	2	2	3	2	3	3	3	3

Note: 1: Slight, 2: Moderate, 3: Substantial

Each student is required to submit a report on the project assigned to him by the department. The report should be based on the information available in the literature or data obtained in the laboratory/industry.

Students, in addition to the home problem will be permitted to undertake industrial/ consultancy project work, outside the department, in industries/Research labs for which proportional weightage will be given in the final assessment.

No. of hours: 60 Periods

Students are advised to carry out the projects in the following domains, but not limited with

- Green Building
- Utilization of Innovative Construction Materials
- Analysis of structures using soft wares
- GIS
- Remote sensing
- Industrial Engineering
- Renewable Energy Sources
- Composites and Nano Technology
- Finance Management
- Emerging Technologies in Civil Engineering, etc.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21EE04P	Semester	VII			
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)		L	T	P	C
Course Title	INTERNSHIP		0	0	0	1

COURSE OBJECTIVES:

- To create knowledge for the students in the field work so as to have a preliminary knowledge of practical problems related to Civil Engineering in carrying out engineering tasks.
- To develop skills in various types of difficulties facing and solving the field problems.
- To provide practical exposure in Civil Engineering related organizations.

PREREQUISITE:

All basic core courses.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C708.1	***Understand*** *the* practical field/industry orientated problem related to Civil Engineering.	K2
C708.2	***Apply*** the theoretical concepts studied in the class rooms.	K2
C708.3	***Explain*** the codal specifications, field work concepts, Designing and analysis of structures, estimating and valuation, quantity surveying & quality control.	K2
C708.4	***Build*** the Technical report and presentation	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAMSPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C708.1	2	1	-	-	-	1	1	1	1	1	1	1	1	1
C708.2	2	1	-	-	-	1	1	1	1	1	1	1	1	1
C708.3	2	1	-	-	-	1	1	1	1	1	1	1	1	1
C708.4	2	1	-	-	-	1	1	1	1	1	1	1	1	1

Note: 1:Slight, 2: Moderate, 3:Substantial

The students individually undergo training in reputed firms/ research institutes / laboratories for the specified duration. After the completion of training, a detailed report should be submitted. The students will be evaluated as per the regulations.

NO OF WEEKS: 2

VIII SEMESTER

SEMESTER VIII										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	-	Professional Elective - IV	PEC	40	60	100	3	0	0	3
2	-	Professional Elective - V	PEC	40	60	100	3	0	0	3
PRACTICAL										
3	21EE06P	Project Phase - II	EEC	60	40	100	0	0	12	6
TOTAL										**12**

LIST OF PROFESSIONAL ELECTIVE COURSES

S. No	COURSE CODE	COURSE TITLE
Professional Elective-IV		
1	21CE811PT	Environmental Pollution Control and Safety Management
2	21CE812PT	Maintenance Repair and Rehabilitation of Structures
3	21CE813PT	Professional Ethics and Human Values
4	21CE814PT	Computer Aided Design of Structures
5	21CE815PT	Smart Infrastructures I

Course code	21CE811PT	Semester	VIII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	ENVIRONMENTAL POLLUTION CONTROL AND SAFETY MANAGEMENT		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

PREREQUISITE:

- Basics of Environmental Engineering and Pollution

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C811. 1	***Understand*** the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management	K2
C811. 2	***Identify*** formulate and solve air and noise pollution problems.	K3
C811. 3	***Design*** stacks and particulate air pollution control devices to meet applicable standards	K3
C811. 4	***Understand*** industrial laws and act to protect water bodies	K2
C811. 5	***Develop*** methodologies for environmental protection and pollution preventive measures	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C811. 1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C811. 2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C811. 3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C811. 4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C811. 5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note:1:Slight, 2: Moderate,3:Substantial

SYLLABUS **No. of Credits:3**

UNIT I AIR AND NOISE POLLUTION CONTROL 7

Sources and Effects– Classification-Photochemical reactions- Atmospheric Stability-Lapse Rates, Inversions, Plume Behaviour -Pollutant Dispersion- Emission Standards and Air Quality Standards- Air Quality Index-Methods of Pollutant Sampling and Measurement-Continuous emission and Air Quality monitoring- Control Methods for Particulate Emissions-Black carbon and Gaseous Pollutants- Indoor Air Pollution- Automobile Pollution

UNIT II AIR POLLUTION AND WATER POLLUTION MITIGATION MEASURES 6

Sources - Types and Characteristics - Control at Source - Air Pollution Control Equipments Like Cyclones - Electrostatic Precipitator - Bag Filter, Scrubber. Sources - Types and Characteristics- Primary, Secondary and Tertiary Wastewater Treatment - Advanced Oxidation Processes, Concept of Common Effluent Treatment Plant.

UNIT III CASE STUDIES ON INDUSTRIAL EFFLUENT TREATMENT PLANTS, SAFETY AND INDUSTRY 11

Refinery - Fertilizer - Occupational and Process Related Hazards- Occupational Safety and Health Administration **(**OSHA) Process Safety Management (PSM) Model - Work Permit System - Use of Personal Protective Equipments - Green Chemistry and Process Safety.

UNIT IV INDUSTRIAL LAWS AND ACT 11

Ground Water Chemistry - Origin, Movement and Quality - Water Quality Standards – Drinking Water – Industrial Water – Irrigation Water - Ground Water Pollution and Legislation - Environmental Regulatory Requirements.

UNIT V ENVIRONMENTAL PROTECTION 10

Concept of Environment and Ecology - Various Natural Cycles in Environment and Ecology - Effect of Human Activities on Environment and Ecology - Various Types of Environmental Pollution in General and in Chemical and Allied Industry in Particular - Sources and Causes of Environmental Pollution - Environmental Impact Assessment and Environment Impact Statement- Methodologies for Environmental Pollution Prevention (Including Process Technology Up Gradation – Development - Invention etc.

TOTAL: 45 Periods

LEARNING RESOURCES:

TEXTBOOKS:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, “Air Pollution Control Engineering”, Tokyo, springer science + science media LLC,2019.
2. Noel de Nevers, “Air Pollution Control Engineering”, Waveland press,Inc 2017
3. Anjaneyulu. Y, “Air Pollution and Control Technologies“ , Allied Publishers (P) Ltd., India 2020.

REFERENCES:

1. GilbertM Masters, W P Ela, Introduction to Environmental Engineering and Science, PHI Learning, 2000.
2. Rao C.S., Environmental Pollution Control Engineering, New Age International, 1999.
3. Daniel A. Crowl, Josheph F. Lowar, Chemical Process Safety, Fundamentals with Applications, Prentice Hall. 2010.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE812PT	Semester	VIII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	MAINTENANCE REPAIR AND REHABILITATION OF STRUCTURES		3	0	0	3

COURSE OBJECTIVES:

- To acquire the knowledge on Quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

PREREQUISITE:

- Knowledge on Construction Management.
- Knowledge on Analysis of Structures.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C812. 1	***Understand*** the basic concept of maintenance and assessment method of distressed structures.	K2
C812. 2	***Identify*** the strength and durability properties of concrete.	K3
C812. 3	***Understand*** the recent development in concrete.	K2
C812. 4	***Develop*** the techniques for repair and protection methods of structures.	K3
C812. 5	***Outline*** repair, rehabilitation and retrofitting of structures and demolition methods.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C812. 1	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C812. 2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C812. 3	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C812. 4	2	1	1	-	-	-	-	-	-	-	-	-	1	1
C812. 5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

Note:1:Slight, 2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I MAINTENANCE AND REPAIR STRATEGIES 9

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating damaged structure, causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE 9

Quality assurance for concrete–Strength, Durability- Cracks, different types, causes–Effects due to climate, temperature, Sustained elevated temperature, Corrosion.

UNIT III SPECIAL CONCRETES 9

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self-compacting concrete, Geo-polymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS 9

Non-destructive Testing Techniques, Load Test for Stability-Epoxy injection, Shoring, Underpinning, Corrosion protection techniques–Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, Cathodic protection.

UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES 9

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage, Earthquake-Transportation of Structures from one place to other - Structural Health Monitoring- demolition Techniques-Engineered Demolition Methods-Case studies.

TOTAL: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Shetty.M.S. Concrete Technology-Theory and Practice, S.Chandand Company-2006.
2. Vidivelli.B Rehabilitation of Concrete Structures Standard Publishes Distribution.1st edition 2010.
3. Varghese.P.C Maintenance Repair and Rehabilitation & Minor works of building, Prentice Hall India Pvt Ltd 2014.
4. Dodge Woodson. R Concrete Structures, Protection, Repair and Rehabilitation, Butterworth- Heinemann, Elsevier, New Delhi 2012.

REFERENCES:

1. Dov Kominetzky. M.S.,-Design and Construction Failures, Galgotia, Publications Pvt.Ltd.,2010
2. Ravishankar.K. Krishnamoorthy. T.S, Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures, Allied Publishers, 2004.
3. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2018.
4. Hand Book on “Repair and Rehabilitation of RCC Buildings”–Director General works CPWD , Govt of India , New Delhi–2002.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course Code	21CE813PT	Semester	VIII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	PROFESSIONAL ETHICS AND HUMAN VALUES		3	0	0	3

COURSE OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values, Moral and Social Values and Loyalty and to appreciate the rights of others.

PREREQUISITE:

- Basic Knowledge on Principle of management

COURSE OUTCOMES:

CO. No.	Course Outcomes	Bloom Level
On successful completion of this course, students will be able to		
C813.1	***Apply*** ethics society, discuss the ethical issues related to engineering and realize.	K3
C813.2	***Create*** awareness on Engineering Ethics and Human Values.	K3
C813.3	***Understand*** the codes of ethics.	K2
C813.4	***Understand*** and realize the responsibilities and rights in the society.	K2
C813.5	***Understand*** the responsibilities about global issues.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C813.1	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C813.2	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C813.3	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C813.4	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C813.5	2	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I HUMANVALUES **10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation –Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERINGETHICS **9**

Senses of 'Engineering Ethics' - Variety of moral issues - Types of inquiry - Moral dilemmas- Moral Autonomy - Kohlberg's theory - Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action - Self-interest - Customs and Religion - Uses of Ethical Theories.

UNIT III ENGINEERINGASSOCIAL EXPERIMENTATION **9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics –A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and Risk - Assessment of Safety and Risk - Risk Benefit Analysis and Reducing Risk - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest — Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights(IPR) - Discrimination.

UNIT V GLOBAL ISSUES **8**

Multinational Corporations–Environmental Ethics–Computer Ethics–Weapons Development– Engineers as Managers–Consulting Engineers–Engineers as Expert Witnesses and Advisors– Moral Leadership–Code of Conduct–Corporate Social Responsibility.

TOTAL: 45 PERIODS

LEARNING RESOURCES:

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, NewDelhi,2016.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India,New Delhi 2010.

REFERENCES:

1. CharlesB. Fleddermann,"Engineering Ethics",PearsonPrenticeHall,NewJersey,2010.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics —ConceptsandCases",CengageLearning, 2009.
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund GSeebauer and RobertL Barry,"Fundamentals ofEthics for Scientists andEngineers",OxfordUniversity Press,Oxford,2001.
5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" McGrawHilleducation, India Pvt.Ltd.,New Delhi, 2000.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE814PT	Semester	VIII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	COMPUTER AIDED DESIGN OF STRUCTURES		3	0	0	3

COURSE OBJECTIVES

- To introduce the students about computer graphics, structural analysis, design and optimization and expert systems, applications in analysis.

PREREQUISITE

- Knowledge on Computer Aided Building Drawing laboratory

COURSE OUTCOMES

CO. No.	Course Outcomes	Blooms level
On successful completion of this course, students will be able to		
C814.1	***Outline*** the concepts of Computer-Aided Design, Software requirements and Hardware components in CAD system.	K2
C814.2	***Acquire*** the knowledge in Computer Graphics and Computer aided drafting using Auto CAD software.	K2
C814.3	***Explain*** the fundamentals of finite element analysis and be able use software for modeling, analysis and design of structures.	K2
C814.4	***Develop*** the concepts of Optimization techniques and its practical applications to structural engineering.	K3
C814.5	***Utilize*** the knowledge in Artificial Intelligence and Knowledge based expert systems.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C814.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C814.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C814.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C814.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C814.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note:- 1: Slight; 2: Moderate; 3 Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION **9**

Fundamental reason for implementing CAD - Software requirements – Hardware components in CAD system – Design process - Applications and benefits.

UNIT II COMPUTER GRAPHICS **9**

Graphic Software – Graphic primitives - Transformations - 2 Dimensional and 3 Dimensional transformations – Concatenation - Wire frame modeling - Solid modeling - Graphic standards - Drafting packages.

UNIT III STRUCTURAL ANALYSIS **9**

Principles of structural analysis - Fundamentals of finite element analysis - Concepts of finite elements – Stiffness matrix formulation – Variation Method – Weighted residual method – Problems – Convergence criteria – Analysis packages and applications.

UNIT IV DESIGN AND OPTIMIZATION **9**

Principles of design of steel and RC structures - Beams and Columns - Applications to simple design problems - Optimization techniques - Algorithms - Linear programming – Simplex Method

UNIT V EXPERT SYSTEMS **9**

Introduction to artificial intelligence - Knowledge based expert systems – Applications of Knowledge Based Expert Systems - Rules and decision tables - Inference mechanisms - simple applications

TOTAL: 45 PERIODS

LEARNING RESOURCES:

TEXT BOOKS:

1. Groover M.P. and Zimmers E.W. Jr., "CAD/CAM, Computer Aided Design and Manufacturing",Prentice Hall of India Ltd, New Delhi, 2014.
2. Krishnamoorthy C.S.Rajeev S., "Computer Aided Design", Narosa Publishing House, New Delhi, 2010.

REFERENCES:

1. Harrison H.B., "Structural Analysis and Design", Part I and II Pergamon Press, Oxford,2000.
2. Rao S.S., "Optimization Theory and Applications", Wiley Eastern Limited, New Delhi, 2004.
3. Richard Forsyth (Ed), "Expert System Principles and Case Studies", Chapman and Hall, London,2010.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE815PT	Semester	VIII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	SMART INFRASTRUCTURES I		3	0	0	3

COURSE OBJECTIVES:

- To develop a basic understanding about various types of Infrastructure and Smart city.
- To enable the students to apply the basic need and planning concept to solve various Infrastructure problems.

PREREQUISITE:

- Construction materials, Construction techniques and practices.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C815.1	***Understand*** the necessity of infrastructural development for smart cities.	K2
C815.2	***Identify*** components of infrastructure and Prepare infrastructure plan for smart city.	K3
C815.3	***Apply the*** smart energy management systems.	K3
C815.4	***Understand*** Study of water resources systems for smart city and its application.	K2
C815.5	***Understand*** National and Global policies to implement for smart city development.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C815.1	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C815.2	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C815.3	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C815.4	2	2	1	-	-	-	-	-	-	-	-	-	1	1
C815.5	2	2	1	-	-	-	-	-	-	-	-	-	1	1

Note:1: Slight,2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I FUNDAMENTAL OF SMARTCITY & INFRASTRUCTURE 9

Introduction of Smart City, Concept of smart city - Objective for smart cities - History of Smart city world and India - Need to develop smart city - Challenges of managing infrastructure in India and world - various types of Infrastructure systems - Infrastructures need assessment.

UNIT II PLANNING & DEVELOPMENT OF SMART CITY INFRASTRUCTURE 9

Energy and ecology - Solar Energy for Smart City, Housing, Sustainable Green Building, Safety, Security, Disaster Management, Economy, Cyber Security, Project Management.

UNIT III INTELLIGENT TRANSPORT SYSTEMS 10

Smart Vehicles and Fuels – GIS – GPS - Navigation system - Traffic Safety Management, Mobility Services – E-Ticketing.

UNIT IV MANAGEMENT OF WATER RESOURCES AND RELATED INFRASTRUCTURE 8

Storage and Conveyance System of Water - Sustainable Water and Sanitation - Sewerage System - Flood Management - Conservation System.

UNIT V INFRASTRUCTURE MANAGEMENT SYSTEM & POLICY FOR SMARTCITY 9

Integrated Infrastructure Management Systems for Smart City - Infrastructure Management System Applications for Existing Smart City - Worldwide Policies for Smart City Government of India - Policy for Smart City, Mission Statement & Guidelines - Smart Cities in India - Case Studies of Smart City.

TOTAL: 45 PERIODS

LEARNING RESOURCES:

TEXTBOOKS:

1. Hudson W.R., Haas R., Uddin W., Infrastructure Management, McGraw-Hill, 1997
2. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities), Nicos Komninos, 2014
3. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony M Townsend, 2013
4. Grig N.S., Infrastructure engineering and management, Wiley-Interference, 2000.

REFERENCES:

1. Mission statement &guidelines on Smart City Scheme". Government of India - Ministry of Urban Development, http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines(1).pdf
2. Smart City on Future Life - Scientific Planning and Construction by Xianyi Li, 2016.

LIST OF PROFESSIONAL ELECTIVE COURSES

S. No	COURSE CODE	COURSE TITLE
Professional Elective-V		
1	21HE652PT	Principles of Management
2	21CE822PT	Construction Planning and Scheduling
3	21CE823PT	Environmental and Social Impact Assessment
4	21CE824PT	Railways, Airports, Docks and Harbour Engineering
5	21CE825PT	Smart Infrastructures II

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	**21HE652PT**	**Semester**	**VIII**			
Category	**PROFESSIONAL ELECTIVE COURSE (PEC)**		**L**	**T**	**P**	**C**
Course Title	**PRINCIPLES OF MANAGEMENT (COMMON TO ECE & CIVIL)**		**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To enable the students to study the evolution of Management system, to study the functions, role and principles of management and to learn the application of the principles in an industries.

PREREQUISITE:

- Nil

COURSE OUTCOMES:

CO. No.	**Course Outcomes**	**Blooms level**
On successful completion of this Course, students will be able to		
C821.1	Students will be able to have clear understanding managerial functions.	K2
C821.2	Students will be able to have clear understanding planning.	K2
C821.3	Students will be able to have clear understanding organizing.	K3
C821.4	Students will be able to have clear understanding staffing and leading.	K3
C821.5	Students will be able to have clear understanding controlling and have same basic knowledge on international aspect of management	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**PSO-1**	**PSO-2**
C821.1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C821.2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C821.3	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C821.4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
C821.5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits:**

UNIT I IMPORTANCE OF MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Comparison of Manager and Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Categories of Business organization - Different types of Titleholders, company-public and private sector enterprises - Organization philosophy and Environment – Current trends and issues in E - Management – case study.

UNIT II OPERATIONS OF PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process - case study.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management- case study.

UNIT IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT- case study**.**

UNIT V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting- case study.

TOTAL: 45 PERIODS

LEARNING RESOURCES:

TEXT BOOKS:

1. Stephen P. Robbins & Mary Coulter, “Management”, 10th Edition, Prentice Hall (India) Pvt.Ltd., 2011.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2010.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management” 7th Edition, Pearson Education, 2011.
2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich “Essentials of management” 6th Edition, Tata McGraw Hill, 2004

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE822PT	Semester	VIII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	CONSTRUCTION PLANNING AND SCHEDULING		3	0	0	3

COURSE OBJECTIVES:

- To make the students to learn about planning of construction projects, scheduling procedures and techniques, cost and quality control projects and use of project information as decision making tool.

PREREQUISITE:

- Basic Fundamentals of construction process.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C822. 1	***Understand*** basic concepts of of planning the projects	K2
C822. 2	***Develop*** alternatives to manage schedule risks	K3
C822. 3	***Understand*** the scheduling and uncertainty in projects	K3
C822. 4	***Analyze*** network schedules using software	K2
C822. 5	***Develop*** work breakdown structure for construction activities	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C822. 1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C822. 2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C822. 3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C822. 4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C822. 5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note:1:Slight, 2: Moderate,3:Substantial

SYLLABUS **No. of Credits:**

UNIT I CONSTRUCTION PLANNING **9**

Basic concepts in the development of construction plans-Choice of Technology and Construction method-Defining Work Tasks- Work breakdown structure- Definition-Precedence relationships among activities-Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems- Time Planning – Cost Planning – Cost Breakdown- Resources breakdown.

UNIT II RESOURCE ALLOCATION **9**

Introduction- Resource allocation-Resource levelling - Resource loading graph - Earned value concepts - Risk cost management - Stages in risk management- Controlling the risk.

UNIT III PROJECT SCHEDULE **9**

Defining the project scope - Project scope checklist - Project priorities - Work Breakdown Structure (WBS) - Integrating WBS with organisation - coding the WBS for the information system - Scheduling Projects: Purpose of a project schedule, historical development, how project schedules are limited and created, develop project schedules, uncertainty in project schedules, Gantt chart - Resource scheduling - network scheduling - software applications to scheduling.

UNIT IV COST AND BUDGET MANAGEMENT **9**

Project Cost Estimation - Cost Budgeting - Earned Value Management – Forecasting - Integration Management - Estimation of Time, Costs and Resources - Resource balancing Analysis and reports using Software tools (Microsoft Project).

UNIT V ORGANIZATION AND USE OFPROJECTINFORMATION **9**

Types of project information-Accuracy and Use of Information-Computerized organization and use of Information - Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

TOTAL: 45 PERIODS

LEARNING RESOURCES:

TEXTBOOKS:

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2010.
2. Srinath, L.S., “Pert and CPM Principles and Applications“, Affiliated East West Press, 2010.

REFERENCES:

1. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pitsburgh,2009.
2. Moder.J., Phillips. C. and Davis E, “Project Management with CPM”, PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 2008.
3. Willis, E.M., “Scheduling Construction projects”, John Wiley and Sons, 2003.
4. Halpin, D.W., “Financial and Cost Concepts for Construction Management”, John Wiley and Sons, New York,1985.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE823PT	Semester	VIII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT		3	0	0	3

COURSE OBJECTIVES:

- To provide a basic understanding of the EIA process as it is used for research, planning, project or program evaluation, monitoring, and regulatory enforcement.
- To introduce students to the legal, economic, social, administrative and technical process of preparing and/or evaluating environmental impact documents.

PREREQUISITE:

- Basics of Environmental Planning and Professions.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C823. 1	***Construct*** portions of environmental documents through administrative and legal requirements and standards of professional practice	K3
C823. 2	***Analyze*** development project plans for possible environmental effects and prepare appropriate initial studies	K3
C823. 3	***Utilize*** EIA documents for policy development, project planning or for legal or political action planning	K3
C823. 4	***Evaluate*** environmental impact assessment reports	K3
C823. 5	***Explain*** different methodologies for environmental impact prediction and assessment	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C823. 1	2	1	1	-	-	-	-	-	-	-	-	-	-	-
C823. 2	2	1	1	-	-	-	-	-	-	-	-	-	-	-
C823. 3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
C823. 4	2	1	1	-	-	-	-	-	-	-	-	-	-	-
C823. 5	2	1	1	-	-	-	-	-	-	-	-	-	-	-

Note:1:Slight, 2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION **9**

Impacts of Development on Environment – Rio Principles of Sustainable Development Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle –EIA Notification and Legal Framework.

UNIT II ENVIRONMENTAL ASSESSMENT **9**

Screening and Scoping in EIA – Drafting of Terms of Reference, Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna – Matrices – Networks – Checklist Methods – Mathematical models for Impact prediction.

UNIT III ENVIRONMENTAL MANAGEMENT PLAN **9**

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Public Hearing-Environmental Clearance.

UNIT IV SOCIO ECONOMIC ASSESSMENT **9**

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis.

UNIT V CASE STUDIES **9**

EIA case studies pertaining to Infrastructure Projects – Roads and Bridges – Mass Rapid Transport Systems – Airports – Dams and Irrigation projects – Power plants.

Total: 45 Periods

LEARNING RESOURCES:

TEXTBOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2009.

REFERENCES:

1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2012.
2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 2016

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE824PT	Semester	VIII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	RAILWAYS, AIRPORTS, DOCKS AND HARBOUR ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- To introduce the students about Railways planning, design, construction and maintenance and planning design principles of airport and harbour.

PREREQUISITE:

- Construction Materials
- Concrete Technology
- .Fundamentals design industrial projects,
- Highway Engineering

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C824.1	***Understand*** the methods of route alignment and design elements in Railway Planning and Constructions.	K2
C824.2	***Understand*** the Construction techniques and Maintenance of Track laying and Railway stations	K2
C824.3	***Analyze*** an insight on the planning and site selection of Airport Planning and design.	K3
C824.4	***Analyze*** and design the elements for orientation of runways and passenger facility systems.	K3
C824.5	***Understand*** the various features in Harbors and Ports, their construction, coastal protection works and coastal Regulations to be adopted.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C824.1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
C824.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C824.3	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C824.4	1	2		-	-	-	-	-	-	-	-	-	-	-
C824.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1:Slight, 2: Moderate,3:Substantial

SYLLABUS **No. of Credits:**

UNIT I RAILWAY PLANNING AND CONSTRUCTION 10

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods--Geometric design of railway, gradient, super elevation, widening of gauge on curves- Level Crossings.

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE 8

Earthwork – Stabilization of track on poor soil - Track drainage – Calculation of Materials required for track laying - Construction and maintenance of tracks – Railway Station and yards and passenger amenities-Signaling.

UNIT III AIRPORT PLANNING 7

Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area.

UNIT IV AIRPORT DESIGN 10

Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings.

UNIT V HARBOUR ENGINEERING 10

Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours - Layout and Terminal Facilities – Coastal Structures - Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Coastal Regulation Zone, 2011.

TOTAL: 45 PERIODS

LEARNING RESOURCES:

TEXTBOOKS:

1. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, V Scitech Publications (India), Chennai, 2010.
2. SaxenaSubhash, C and Satyapal Arora, A Course in Railway Engineering, DhanapatRai and Sons, Delhi, 2013.
3. Khanna.S.K. Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand and Bros, Roorkee, 2012.

REFERENCES:

1. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2016.
2. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2017.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE-New Delhi, Affiliated to Anna University, Chennai

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21CE825PT	Semester	VIII			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	SMART INFRASTRUCTURES II		3	0	0	3

COURSE OBJECTIVES:

- Learn about the state-of-the-art strategies for effectively managing the transition from legacy infrastructure to smart urban systems.
- Understand the management of smart urban transportation systems as well as smart urban energy systems.
- Gain a deep understanding of the nature of disruptive innovations in smart infrastructure systems.

PREREQUISITE:

- Basic Fundamentals of infrastructure growth.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this course, students will be able to		
C825. 1	***Understand*** the fundamental concepts of smart and sustainable cities	K2
C825. 2	***Explain*** the component of smart cities and dwell into their technological advancement	K2
C825. 3	***Build*** the involvement of stake holders in the design and implementation of responsive smart cities	K3
C825. 4	***Explain*** the importance of different linkages and their roles including government, urban planners, universities, city developers and communities	K2
C825. 5	***Identify*** and recognize the role of ICT and data analytics in addressing the urban challenges and key issues	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C825. 1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C825. 2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C825. 3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C825. 4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C825. 5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1:Slight, 2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I SMART CITIES – STATE OF THE ART **9**

Urbanization and developing countries – Sustainable Development and cities – Urban prosperity – Evolution of smart cities – Smart city components and categories – Policy framework for smart cities - India 100 smart cities policy and mission – Common flaws in planning smart cities.

UNIT II SMART URBAN MOBILITY **9**

Objectives and components of urban mobility – Emerging concepts and strategies – Land use, urban form, and mobility – Transit oriented development – use of non-motorized transport – smart mobility – Major ICT supported smart mobility systems – RTIS, Automated fare collection systems, car/bike sharing systems, Intelligent signalling systems, RTMS, Parking information system, Automated vehicle location systems – Smart Mobility: Comprehensive model proposal.

UNIT III SMART ENERGY **9**

Overview – Ways and means to be energy smart – Influence of urbanization and climate change – urban density and energy use – elements of smart energy management system – strategies in making a city energy smart – making of a smart grid – use of electric vehicles(EVs) – Smart energy transformation – Challenges in making cities energy smart.

UNIT IV SMART WATER AND WASTE MANAGEMENT **9**

Smart water management – water resources and cycles – Implementing smart water management – Policy Challenges and Road Ahead – Waste Management Changing Approaches – Approach vs implementation – Smart Waste Management Strategies – Innovation in Conventional process, IoT and ICT based waste collection and management, automated waste collection systems – Smart Waste Management Challenges and Policies & Road ahead.

UNIT V E- GOVERNANCE AND IOT **9**

The power of ICT to integrate urban services – Taxonomy of layers of ICT Architecture, Access layer, Application layer, Data Layer, Communication layer, instrumentation layer, IOT /M2M layer – Major Technology areas – Network, storage, computing, sensor, Information Security Technologies – ICT Major Components, Data Storage and Management, Network Infrastructure – Network Infrastructure for smart cities – Benefits of employing ICT – Emerging Technologies – IOT, Big Data Analytics and Cloud Computing, Artificial Intelligences, Machine and Deep Learning, Fifth Generation (5G) Network services – ICT Challenges, concerns and road ahead.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Jonathan Reichenta " Smart Cities for Dummies'', 2016.
2. Mani.N "Smart Cities and Urban Development in India" New Century Publications, 2016.

REFERENCES:

1. Anilkumar, Introduction to Smart Cities, Pearson India Education Services, 2015.
2. Jonathan Reichenta, " Smart Cities for Dummies"-2013
3. Kassim Rehana ,Dr.Big Data for a Sustainable Smart City, Partridge Publishing Singapore, 2014

Course code	21EE06P	Semester	VIII			
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)		L	T	P	C
Course Title	PROJECT PHASE - II		0	0	12	6

COURSE OBJECTIVES:

- The objective of the project is to make use of the knowledge gained by the student at various stages of the degree course.

PREREQUISITE:

- Strength of Materials I & II, Surveying Instruments & Measuring, Analysis of Structures I & II, Design of Reinforced Concrete Elements, Design of Steel Structures, Structural Design & Drafting, Concrete Technology, Waster Supply Engineering, Waste Water Engineering, Highway Engineering, Construction Management & Estimation, Costing & Valuation Engineering

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C803.1	***Apply*** the fundamental concept learnt during the theory courses to solve industrial problems	K3
C803.2	***Analyze*** the current status based on the information available in the literature or data obtained in the laboratory/ industry	K4
C803.3	***Develop*** material and energy balance for deisgn calculations	K3
C803.4	***Design*** of structural members	K3
C803.5	***Inspect*** the economics of a process through cost estimation	K4
C803.6	***Identify*** industrial problem, design process to carry out the process in an economically feasible way	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C803.1	3	3	2	2	3	3	3	3	3	3	2	2	2	2	2
C803.2	2	2	3	3	3	2	3	2	3	3	3	3	2	2	3
C803.3	3	3	3	2	3	3	2	3	3	2	3	3	3	3	3
C803.4	3	3	3	3	3	2	2	3	3	3	2	2	3	3	3
C803.5	3	3	3	3	3	3	3	3	2	2	3	3	2	3	3
C803.6	2	2	3	2	2	2	2	2	2	3	2	3	3	3	3

Note: 1: Slight, 2: Moderate, 3: Substantial

Each student is required to submit a report on the project assigned to him by the department. The report should be based on the information available in the literature or data obtained in the laboratory/industry.

Students, in addition to the home problem will be permitted to undertake industrial/ consultancy project work, outside the department, in industries/Research labs for which proportional weightage will be given in the final assessment.

Students are advised to carry out the projects in the following domains, but not limited with

- Green Building
- Utilization of Innovative Construction Materials
- Analysis of structures using soft wares
- GIS
- Remote sensing
- Industrial Engineering
- Renewable Energy Sources
- Composites and Nano Technology
- Finance Management
- Emerging Technologies in Civil Engineering, etc.

No. of hours: 180 Periods