Francis Xavier Engineering College

(An Autonomous Institution)
Tirunelveli 627 003
Tamil Nadu India
Department of CIVIL ENGINEERING

Curriculum and Syllabi – R 2021-UG

CHOICE BASED CREDIT SYSTEM AND OBE

Vision of the Department

To create competitive and innovative civil engineers and to contribute technology for the sustainable development of the society

Mission of the Department

1. **To perpetuate the noble tradition of civil engineering through quality education, research, consultancy and public service.**
2. **To promote innovative and original thinking in the minds of young engineers to face the future challenges.**

Table of Content

Programme Educational Outcomes (PEOs)

PEO 1 **Engineering basics:** To communicate deep knowledge on basic sciences and applications of basic sciences in engineering.

PEO 2 **Career Development:** To assimilate the knowledge on basic sciences and engineering concepts to address industrial, social and environmental issues and to innovate technologies for betterment.

PEO 3 **Leadership responsibilities:** To develop interpersonal skills to strengthen team work, leadership quality and to promote awareness about continual learning not limited to higher studies.

PEO 4 **Professional qualification:** To boost professionalism in problem solving through moral and professional ethics shouldering social task.

Programme Specific Objectives (PSOs)

PSO_1 Investigate, Analyze, Plan and Design the problems in multivarious domains of civil engineering.

PSO_2 Work with ethical principles and sound managerial skills in the promotion of civil engineering infrastructure keeping in mind, health, safety and sustainability of the society.

Programme Outcomes (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‟s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Mapping with PO Vs PEO, PSO

PO	PEO1	PEO2	PEO3	PEO4	PEO5	PSO1	PSO2
1		3				3	
2		2				3	
3		3	3	2			
4	2	3					3
5				3		2	
6			1	2			
7				3			2
8	3			1			3
9	2					3	
10	3					3	
11	3						2
12	2	3	3				

FRANCIS XAVIER ENGINEERING COLLEGE

B.E. – CIVIL ENGINEERING

REGULATIONS 2021

Choice Based Credit System and Outcome Based Education

SUMMARY OF CREDIT DISTRIBUTION

S.No	Category	Credits Per Semester								Total Credits	Credits in %
		I	II	III	IV	V	VI	VII	VIII		
1	**HSSM**	3	2	1	4			3		**13**	**7.8**
2	**BS**	12	4	4						**20**	**12.04**
3	**ES**	3	16	6						**25**	**15.06**
4	**PC**			11	20	17	9	3		**60**	**36.14**
5	**PE**					3	9	6		**18**	**10.84**
6	**OE**					3	3	6		**12**	**7.22**
7	**EEC**			1	1	1	2	3	10	**18**	**10.84**
Total		18	22	23	25	24	23	21	10	**166**	**100**

Minimum Number of Credits to be acquired: 166

HSSM - Humanities and Social Sciences including Management

BS - Basic Science

ES - Engineering Sciences

PC - Professional Core

PE - Professional Elective

OE – Open Elective / Programme Specific Elective for Expandable Scope

EEC - Employability Enhancement Course

FRANCIS XAVIER ENGINEERING COLLEGE

B.E. – CIVIL ENGINEERING

REGULATIONS 2021

Choice Based Credit System and Outcome Based Education

I-VIII Semester Curriculum and Syllabi

SEMESTER I

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21MA1201	Matrices and Advanced Calculus	BS	4	3	1	0	4
2	21PH1302	Engineering Physics	BS	3	3	0	0	3
3	21CY1401	Engineering Chemistry	BS	3	3	0	0	3
Theory cum Practical Course								
1	21HS1101	English for Professional Communication	HSSM	4	2	0	2	3
2	21CS1514	C Programming	ES	5	1	0	4	3
Practical Courses								
1	21PY1311	Physics and Chemistry Lab	BS	4	0	0	4	2
Total				**23**	**12**	**1**	**10**	**18**

SEMESTER II

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS2101	English for Technical Communication	HSSM	2	2	0	0	2
2	21MA2201	Partial Differential Equation and Application of Fourier Series	BS	4	3	1	0	4
3	21EE2503	Fundamentals of Electrical and Electronics Engineering	ES	3	3	0	0	3
4	21CE2501	Mechanics for Civil Engineering	ES	4	3	1	0	4
Theory cum Practical Course								
1	21ME1513	Computer Aided Engineering Graphics	ES	6	2	0	4	4
2	21CS2512	Python Programming	ES	5	1	0	4	3
Practical Courses								
1	21GE1512	Engineering Workshop	ES	4	0	0	4	2
			Total	**28**	**14**	**2**	**12**	**22**

SEMESTER III

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS1103	**தமிழர் மரபு /** Tamil Heritage	HSSM	2	2	0	0	1
1	21MA3201	Probability & Statistical Analysis	BS	4	3	1	0	4
2	21CE3601	Construction material, techniques and practices	PC	3	3	0	0	3
3	21CE3602	Surveying	PC	3	3	0	0	3
4	21CE3603	Engineering Geology	PC	3	3	0	0	3
Theory cum practical								
1	21CE3501	Strength of Materials I	ES	5	3	0	2	4
Practical Courses								
1	21CE3611	Surveying Laboratory	PC	4	0	0	4	2
2	21CE3511	Computer Aided Building Drawing Laboratory	ES	4	0	0	4	2
Employability Enhancement Course								
3	21PT3902	Verbal Ability	EEC	2	0	0	2	1
			Total	**28**	**17**	**1**	**12**	**23**

SEMESTER IV

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS1104	தமிழரும் தொழில்நுட்பமும் /Technology in Tamil Culture	HSSM	2	2	0	0	1
2	21HS3101	Ethical and Moral Values	HSSM	3	3	0	0	3
3	21CE4601	Concrete Technology	PC	3	3	0	0	3
4	21CE4602	Fluid Mechanics and Hydraulic Machines	PC	3	3	0	0	3
5	21CE4603	Strength of Materials II	PC	3	3	0	0	3
6	21CE4604	Soil Mechanics	PC	3	3	0	0	3
Theory cum practical								
1	21CE4605	Highway Engineering	PC	5	3	0	2	4
Practical Courses								
1	21CE4611	Hydraulic Engineering Laboratory	PC	4	0	0	4	2
2	21CE4612	Construction Materials Laboratory	PC	4	0	0	4	2
Employability Enhancement Course								
1	21MA4001	Aptitude I	EEC	2	0	0	2	1
Mandatory Courses								

1	21GE2M02	Environmental and Sustainable Engineering	MC	2	2	0	0	0
			Total	**32**	**22**	**0**	**12**	**25**

SEMESTER V

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CE5601	Structural Analysis –I	PC	3	3	0	0	3
2	21CE5602	Design of Reinforced Concrete Elements	PC	3	3	0	0	4
3	21CE5603	Foundation Engineering	PC	3	3	0	0	3
4	21CE5604	Water Supply and Wastewater Engineering	PC	3	3	0	0	3
5		Professional Elective I	PE	3	3	0	0	3
6		Open Elective I	OE	3	3	0	0	3
Practical Courses								
1	21CE5611	Water and Waste Water Engineering Laboratory	PC	4	0	0	4	2
2	21CE5612	Soil Mechanics Laboratory	PC	4	0	0	4	2
Employability Enhancement Course								
1	21PT5901	Reasoning	EEC	2	0	0	2	1
			Total	**28**	**18**	**0**	**10**	**24**

SEMESTER VI

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CE6601	Design of Steel Structures	PC	4	3	1	0	4
2	21CE6602	Structural Analysis-II	PC	3	3	0	0	3
3		Professional Elective II	PE	3	3	0	0	3
4		Professional Elective III	PE	3	3	0	0	3
5		Professional Elective IV	PE	3	3	0	0	3
6		Open Elective II	OE	3	3	0	0	3
Practical Courses								
1	21CE6611	Structural Analysis and Design laboratory	PC	4	0	0	4	2
Employability Enhancement Course								
1	21CE6912	Survey camp*	EEC	4	0	0	2	1
2	21MA6001	Aptitude II	EEC	2	0	0	2	1
* Two weeks during FIFTH semester vacation								
			Total	**29**	**18**	**1**	**8**	**23**

SEMESTER VII

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21GE7101	Total Quality Management	HSSM	3	3	0	0	3
2	21CE7701	Estimation and cost analysis	PC	3	3	0	0	3
3		Professional Elective V	PE	3	3	0	0	3
4		Professional Elective VI	PE	3	3	0	0	3
5		Open Elective III	OE	3	3	0	0	3
6		Open Elective IV	OE	3	3	0	0	3
Practical Courses								
1	21CE7911	Innovative Design Project	EEC	4	0	0	6	3
			Total	**22**	**18**	**0**	**6**	**21**

SEMESTER VIII

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
1	21CE8911	Project Work-	EEC	20	0	0	20	10
			Total	**20**	**0**	**0**	**20**	**10**

Minimum Number of Credits to be Acquired: 166 (Regular) / 126 (Lateral)

List of Humanities and Social Sciences Including Management (HSSM) Courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS2101	English for Technical Communication	HSSM	2	2	0	0	2
2	21HS1103	**தமிழர் மரபு /** Tamil Heritage	HSSM	3	2	0	0	1
3	21HS3101	Ethical and Moral Reasoning	HSSM	3	3	0	0	3
4	21HS1104	தமிழரும் தொழில்நுட்பமும் / Technology in Tamil Culture	HSSM	2	1	0	0	1
5	21GE7101	Total Quality Management	HSSM	3	3	0	0	3
Theory cum Practical Courses								
4	21HS1101	English for Professional Communication	HSSM	4	2	0	1	3

List of Basic Science Courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21MA1201	Matrices and Advance Calculus	BS	4	3	1	0	4
2	21PH1302	Engineering Physics	BS	3	3	0	0	3
3	21CY1401	Engineering Chemistry	BS	3	3	0	0	3
4	21MA2201	Partial Differential Equation and Application of Fourier Series	BS	4	3	1	0	4
5	21MA3201	Probability & Statistics	BS	4	3	1	0	4
Practical Courses								
1	21PY1311	Physics and Chemistry Lab	BS	4	0	0	4	2

List of Engineering Science Courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21EC1503	Fundamentals of Electrical and Electronics Engineering	ES	3	3	0	0	**3**
2	21CE2501	Mechanics for Civil Engineering	ES	4	3	1	0	4
Theory cum Practical Courses								
1	21CS1514	C Programming	ES	3	1	0	2	3
2	21ME1513	Computer Aided Engineering Graphics	ES	4	3	1	0	4
3	21CS2512	Python Programming	ES	4	1	0	2	**3**
4	21CE3501	Strength of Materials I	ES	5	3	0	2	4
Practical Courses								

1	21GE1512	Engineering Workshop	ES	4	0	0	4	2
2	21CE4613	Computer Aided Building Drawing Laboratory	ES	4	1	0	4	2

List of Employability Enhancement Course

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Practical Courses								
1	21PT3902	Verbal Ability	EEC	2	0	0	2	1
2	21MA4001	Aptitude I	EEC	2	0	0	2	1
3	21GE5901	Reasoning	EEC	2	0	0	2	1
4	21MA6001	Aptitude II	EEC	2	0	0	2	1
5	21CE6912	Survey camp	EEC	4	0	0	2	1
6	21CE7912	Innovative Design Project	EEC	4	0	0	6	3
7	21CE8911	Project Work	EEC	20	0	0	20	10

List of Professional Electives Courses

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/ Domain
Professional Elective I								
1	21CE5701	Geographic Information System	5	3	0	0	3	Geo informatics
2	21CE5702	Pavement Design	5	3	0	0	3	Transportation
3	21CE5703	Construction Planning and Scheduling	5	3	0	0	3	Construction
4	21CE5704	Disaster Preparedness and Planning	5	3	0	0	3	Safety Engineering
5	21CE5705	Non Destructive Testing of Materials	5	3	0	0	3	Construction Material
6	21CE5706	Hydrology and irrigation Engineering	5	3	0	0	3	Water resources
Professional Elective II								
1	21CE6701	Municipal Solid Waste Management	6	3	0	0	3	Environmental Engineering
2	21CE6702	Remote Sensing	6	3	0	0	3	Geoinformatics
3	21CE6703	Construction Management	6	3	0	0	3	Construction
4	21CE6704	Traffic Engineering	6	3	0	0	3	Transportation
5	21CE6705	Safety in Construction	6	3	0	0	3	Construction
6	21CE6706	Water Resources Systems Engineering	6	3	0	0	3	Water resources
Professional Elective III								
1	21CE6707	Railways, Airport and Harbour Engineering	6	3	0	0	3	Transportation
2	21CE6708	Geoinformatics Applications for Civil Engineers	6	3	0	0	3	Geo informatics

3	21CE6709	Industrial Wastes Treatment and Disposal	6	3	0	0	3	Environmental Engineering
4	21CE6710	Air Pollution Management	6	3	0	0	3	Environmental Engineering
5	21CE6711	Housing Planning and Management	6	3	0	0	3	Management
6	21CE6712	Human Rights	6	0	0	3	3	Sociology
Professional Elective IV								
1	21CE6713	Ground Water Engineering	6	3	0	0	3	Water resources
2	21CE6714	Ground Improvement Techniques	6	3	0	0	3	Geotechnical
3	21CE6715	Corrosion and its Control	6	3	0	0	3	Environmental Engineering
4	21CE6716	Design of Brick Masonry Structures	6	3	0	0	3	Structural
5	21CE6717	Geo-Environmental Engineering	6	3	0	0	3	Environmental Engineering
6	21CE6718	Transport Planning and Management	6	3	0	0	3	Transport
Professional Elective V								
1	21CE7701	Interior Decoration	7	0	0	3	3	Architecture
2	21CE7702	Prestressed concrete structures	7	0	0	3	3	Structural
3	21CE7703	Structural Health Monitoring	7	0	0	3	3	Structural
4	21CE7704	Introduction to Soil Dynamics and Machine Foundations	7	0	0	3	3	Geotechnical
5	21CE7705	Prefabricated Structures	7	3	0	0	3	Structural
6	21CE7706	Entrepreneurship Development	7	3	0	0	3	Entrepreneurship
Professional Elective VI								
1	21CE7707	Economics and Business Finance for Civil Engineers	7	3	0	0	3	Business Management
2	21CE7708	Repair and Rehabilitation of Structures	7	3	0	0	3	Structural
3	21CE7709	Structural Dynamics and Earthquake Engineering	7	3	0	0	3	Structural
4	21CE7710	Intellectual Property Rights	7	3	0	0	3	Management
5	21CE7711	Architecture and Town Planning	7	3	0	0	3	Architecture
6	21CE7712	Environmental Impact Assessment	7	3	0	0	3	Environmental

List of Open Electives Courses

(Offered to Other Branches)

S.No	Course Code	Course Name	Sem	L	T	P	C	Offered By
Open Elective I								
1	21CE5801	Fundamentals of CIVIL Engineering (Except EEE)	5	3	0	0	3	CIVIL
2	21CE5802	Elements of environmental Engineering	5	3	0	0	3	CIVIL
3	21CE5803	Geo-technical Engineering	5	3	0	0	3	CIVIL
4	21CE5804	Building Services	5	3	0	0	3	CIVIL
5	21CE5805	Elements of Transportation Engineering	5	3	0	0	3	CIVIL
Open Elective II								
1	21CE6801	Remote sensing & GIS	6	3	0	0	3	CIVIL
2	21CE6802	Construction Materials	6	3	0	0	3	CIVIL
3	21CE6803	Water Resources Conservation	6	3	0	0	3	CIVIL
4	21CE6804	Waste Management	6	3	0	0	3	CIVIL
5	21CE6805	Sustainable Construction Methods	6	3	0	0	3	CIVIL
Open Elective III								
1	21CE7701	Building Planning and Construction	7	3	0	0	3	CIVIL
2	21CE7702	Environmental and Social Impact Assessment	7	3	0	0	3	CIVIL
3	21CE7703	Energy Conservation in Building	7	3	0	0	3	CIVIL
4	21CE7804	Waste Water Treatment	7	3	0	0	3	CIVIL
5	21CE7805	Green Building design	7	3	0	0	3	CIVIL
Open Elective IV								
1	21CE7806	Intelligent Transportation Systems	8	3	0	0	3	CIVIL
2	21CE7807	Concept of Architectural design	8	3	0	0	3	CIVIL
3	21CE7808	Air Pollution and Control Engineering	8	3	0	0	3	CIVIL
4	21CE7809	Testing of Materials	8	3	0	0	3	CIVIL
5	21CE7810	Disaster management	8	3	0	0	3	CIVIL

SEMESTER I

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21MA1201	Matrices and Advanced Calculus	BS	4	3	1	0	4
2	21PH1302	Engineering Physics	BS	3	3	0	0	3
3	21CY1401	Engineering Chemistry	BS	3	3	0	0	3
Theory cum Practical Courses								
1	21HS1101	English for Professional Communication	HSSM	3	1	0	2	3
2	21CS1514	C Programming	ES	3	2	0	1	3
Practical Courses								
1	21PY1311	Physics and Chemistry Lab	BS	4	0	0	4	2
Total				**23**	**12**	**1**	**10**	**18**

21MA1201	MATRICES AND ADVANCED CALCULUS	L	T	P	C
		3	1	0	4

Preamble:

The course consists of topics in Matrices, Differential calculus, Integral calculus, Differential Equations and Vector calculus with applications to various engineering problems. This course will cover the following main topics: Cayley Hamilton Theorem, Linear differential equations of second order with constant coefficients, Methods of Variation parameter, Taylor's expansion of two variables, Maxima and Minima for two variables, Area and Volume in a multiple integrals, Green's theorem and Gauss divergence theorem.

Prerequisites for the course:

Students should have basic knowledge about matrices, differentiation and integration

Objectives

1. To apply advanced matrix knowledge to Engineering problems
2. To familiarize with the applications of differential equations.
3. To familiarize with the functions of several variables
4. To have Knowledge in Multiple integrals
5. To improve their ability in Vector calculus.

UNIT I	MATRICES	9+3

Matrices - Characteristic equation – Eigen values and Eigen vectors of a symmetric and non symmetric matrix – Properties of Eigen values and Eigen vector – Cayley – Hamilton theorem and its applications

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Eigen values , Eigen Vectors and Cayley Hamilton Theorem and Add MATLAB and for application Add Power method to find Eigen value & Eigen vector

UNIT II	ORDINARY DIFFERENTIAL EQUATIONS	9+3

Differential Equations – Complementary Function – Particular Integral - Linear equations of second order with constant coefficients of types exponential, trigonometry, polynomial and its combination forms - Methods of Variation of parameter - Engineering Applications.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Linear differential equations of different types and Method of Variation parameters.

UNIT III	**FUNCTIONS OF SEVERAL VARIABLES**	**9+3**

Function of two variables – Partial derivatives – Taylor's expansion for two variables – Maxima and Minima for two variables – Jacobians of two and three variables – Euler's theorem for homogeneous function.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Taylor's series, Jacobians, Maxima and Minima for two variables

UNIT IV	**MULTIPLE INTEGRALS**	**9+3**

Definite Integrals – Properties of definite integrals - Double integration in Cartesian coordinates – Area as a double integral in Cartesian coordinates – Triple integration in Cartesian coordinates – Volume as a Triple Integral

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Area , Triple integration and Volume

UNIT V	**VECTOR CALCULUS**	**9+3**

Vector dot product and Vector cross product - Gradient, divergence, curl – Solenoidal and irrotational fields –Unit normal vector - Angle between two surfaces - Directional derivatives – Green's theorem, Gauss divergence theorem (without proof) – Engineering Applications.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Angle between two surfaces, Green's theorem, Gauss divergence theorem.

Total Periods	**45 + 15 = 60 Periods**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive Questions	1.Assignment 2. Online Quizzes	**1. Descriptive Questions**

Outcomes

Upon completion of the course, the students will be able to:

CO1: Find the eigen values, eigen vectors, inverse and the positive powers of a square matrix (Apply)

CO2: Identify the suitable method to solve second and higher order differential equations (Apply)

CO3: Find the maxima and minima for a given function with several variables, through by finding stationary points (Apply)

CO4: Compute area and volume using double and triple integration. (Apply)

CO5: Apply the concepts of Differentiation and Integration to Vectors. (Apply)

Text Books

1. B. S. Grewal, " Higher Engineering Mathematics", 43rd edition, 2017.
2. James Stewart, Calculus – Early Transcendals, 8th Edition, 2016.

Reference Books

1. A Textbook of Engineering Mathematics(Dr. A.P.J. Abdul Kalam Technical University, Lucknow) (For . Gautam Bhudh technical Universities ,Lucknow) January 2020
2. K. Ganesan, Sundarammal Kesavan, K. S. Ganapathy Subramanian & V. Srinivasan, "Calculus and Solid Geometry", Revised Edition, 2017

Web Resources

1. Eigen values and eigen vectors - https://youtu.be/h5urBuE4Xh
   Cayley Hamilton theorem -https://youtu.be/WROFJ15hk00
2. ODE - https://youtu.be/Im242eBqaxw
3. Functions of several variables -https://youtu.be/PA82F91e1vs
4. Integration - https://youtu.be/bVui07yHjzE,
   Multiple integrals -https://youtu.be/3BbrC9JcjOU
   Volume as Triple integral - https://youtu.be/w_KiHgultbM
5. Vector calculus - https://youtu.be/v3ZC4Mo1fS0i
   Gauss divergence theorem https://youtu.be/U9LDcmKUGS0

CO Vs PO Mapping and CO Vs PSO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	3	2	1	1	1			1	1			1			
2	3	2	1	1				1	1			1			
3	3	2	1	1				1	1			1			
4	3	2	1	1				1	1			1			
5	3	2	1	1				1	1			1			

BLOOOMS LEVEL ASSESSMENT PATTERN

BLOOM'S CATEGORY	ASSESSMENT TESTS				END SEMESTER EXAMINATION
	CAT – 1	CAT -2	FAT - 1	FAT - 2	
REMEMBER	10	10	5	5	10
UNDERSTAND	30	30	10	10	30
APPLY	60	60	10	10	60
ANALYZE	0	0	0	0	0
EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1 (CO 1) : (Apply)

1) Compute the eigen values and eigen vectors for the Symmetric matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$

2) Find A^{-1} and A^4 using Cayley Hamilton Theorem for the matrix $A=\begin{bmatrix} 1 & -1 & 4 \\ 3 & 2 & -1 \\ 2 & 1 & -1 \end{bmatrix}$.

COURSE OUTCOME 2 (CO 2) : (Apply)

a. Solve $(D^2 - D + 1)y = \sin 2x + e^{-4x}$

b. Solve $(D^2 + a^2)\, y = \tan ax$ by using method of variation of parameters.

COURSE OUTCOME 3(CO 3) : (Apply)

1. Find the extreme values of the function $f(x, y)= x^3 + y^3 - 12x - 3y + 20$.
2. Calculate the maxima and minima of the function $f(x, y) = x^3y^2$ (1-x-y).

COURSE OUTCOME 4(CO 4) : (Apply)

1)Find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

2) Find $\int_0^a \int_0^b \int_0^c xyz\, dz\, dy\, dx$

COURSE OUTCOME 5(CO 5) : (Apply)

1. Find the directional derivative of $\phi = xy^2 + yz^3$at the point (2,-1,1) in the direction of $\vec{\imath} + 2\vec{\jmath} + 2\vec{k}$.
2. Using Green's theorem , find $\int_c (x^2 - y^2)dx + 2xydy$ where C is the boundary of the rectangle in the XOY-plane bounded by the lines $x = 0, x = a, y = 0, y = b$.
3. Verify Gauss divergence theorem for $\vec{F} = 4xz\vec{\imath} - y^2\vec{\jmath} + yz\vec{k}$ over the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0$ and $z = 1$.

21PH1302	ENGINEERING PHYSICS (COMMON TO CIVIL & MECH)	L	T	P	C
		3	0	0	3

Preamble

This course aims in imparting the fundamental connection of physics and engineering with machines and materials by incorporating the basic concepts & principles of physics to encompass the application in engineering.

Prerequisites for the course

Students should have Basic theoretical concepts of Physics in XI and XII

Objectives

1. To enable the students to gain knowledge on properties of matter.
2. To inculcate knowledge on heat transfer.
3. To study the basics of acoustics and ultrasonics.
4. To understand the crystal parameters and to classify the type of the defect present in the crystal.
5. To explore the wide advancement in engineering materials by motivating the applications of quantum mechanics.

UNIT I	PROPERTIES OF MATTER	9

Elasticity - Poisson's ratio and relationship between moduli (qualitative) - Stress-strain diagram - Factors affecting elasticity - Torsion pendulum -Determination of rigidity modulus- Moment of inertia of a body (regular)- Bending of beams - Bending moment - Cantilever - Theory and experiment of Young's modulus determination - Uniform and non-uniform bending - I shaped girders.

UNIT II	THERMAL PHYSICS	9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints – bimetallic strips – thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity – Lee's disc method: theory and experiment – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT III	ACOUSTICS AND ULTRASONICS	9

Classification of Sound- decibel- Weber–Fechner law –Absorption Coefficient and its determination-Sound absorbing materials –factors affecting acoustics of buildings and their remedies. Production of ultrasonics by magnetostriction and piezoelectric methods - Engineering applications of Ultrasonics -Non-destructive testing- Pulse echo technique.

UNIT IV	SOLID STATE PHYSICS	9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, coordination number and packing factor for SC, BCC, FCC, HCP – Crystal imperfections: point defects, line defects – Burger vectors. Applications: Powder X-ray diffraction

UNIT V	**ADVANCED ENGINEERING MATERIALS**	**9**

Metallic glasses: Types, Glass forming ability of alloys, melt spinning process and applications Shape memory alloys (SMA): Phase, shape memory effect, pseudo elastic effect NiTi alloy, application, Nanomaterials: Preparation (bottom up and top down approaches) -Pulsed Laser Method- Ball Milling Method – properties and applications.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
Descriptive	1. Assignment 2. Online Quizzes 3. Problem-Solving Activities	Descriptive

Outcomes

Upon completion of the course, the students will be able to:

CO1	Recognize the concept of elasticity, stress, strain and bending moments as well as Uniform and non-uniform bending in beams. (Understand)
CO2	Apply the thermal applications to various home appliances. (Apply)
CO3	Understand the characteristics of Music and Noise, Noise pollution and its control using the basic concepts of acoustics, know the principle and properties of ultrasonics using different testing methods. (Understand)
CO 4	Demonstrate an understanding of several key areas of Crystal Physics. (Understand)
CO 5	Identify different types of material processing techniques for advanced materials. (Understand)

Text Books

1. Dr.P.Mani, Dhanam Publication "Engineering Physics-I", Dhanam Publications, 2018.
2. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.

Reference Books

1. Pandey, B.K. & Chaturvedi, S. —Engineering Physics.Cengage Learning India2018
2. Raghavan, V. "Materials Science and Engineering: A First course". PHI Learning, 2015.
3. Sankar, B.N., Pillai.S.O., Engineering Physics I, New Age International (P) Ltd., 2015.
4. D. Halliday, R. Resnick and J. Walker. Principles of Physics, Wiley (Indian Edition), 2015.

5. Guozhong Cao, Nanostructures and Nanomaterials, Imperial College Press, 2004.
6. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw-Hill (Indian Edition), 2017.

Web Resources

1. https://archive.nptel.ac.in/courses/122/107/122107035/
2. https://archive.nptel.ac.in/courses/115/105/115105099/
3. Unit I,II,IV -https://www.brainkart.com/subject/Engineering-Physics_263/
4. Unit III- https://www.tce.edu/sites/default/files/PDF/RV3-ACOUSTICS-ULTRASONICS.pdf
5. UnitV-https://www.brainkart.com/article/Advanced-Engineering-Materials-Metallic-Glasses_6815/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	3	2	1				1	1				1		
2	3	2	1				1	1				1		
3	3	2	1				1	1				1		
4	3	2					1	1				1		
5	3	2					1	1				1		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10	10	10	10
UNDERSTAND	50	50	20	20	40
APPLY	40	40	20	20	50
ANALYZE	0	0	0	0	0

EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0
	100	100	50	50	100

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Recognize the concept of elasticity, stress, strain and bending moments as well as Uniform and non-uniform bending in beams. (Understand)

1. A Scale is under depression at the free end of a cantilever due to load. Describe an experiment to determine the young's modulus of the cantilever using this expression.
2. Give the theory of torsion pendulum and describe a method to find the moment of inertia of an irregular body.
3. How will you determine the young's modulus of material of a bar by non-uniform Bending method? Explain briefly the theory behind the determination of young's modulus.

COURSE OUTCOME 2: Apply the thermal applications to various home appliances. (Apply)

1. Can heat exchange through a medium, explain their detailed overview depending on the medium. .
2. Imagine a quantity of heat flowing through a metal slab whose faces are kept at two different temperatures. Determine the thermal conductivity of a bad conductor.
3. The total area of a glass window pane is 0.8 m^2. Calculate how much heat is conducted per hour through the glass window pane if the thickness of glass is 3 mm. The temperature of the inside surface is 25 °C and outside surface is 4 °C. The thermal conductivity of glass is 1.1 Wm-1K-1

COURSE OUTCOME 3: Understand the characteristics of Music and Noise, Noise pollution and its control using the basic concepts of acoustics and know the principle and properties of ultrasonics using different testing methods. (Understand)

1. With the help of a neat sketch the construction and production of ultrasonic waves using piezoelectric oscillator.
2. Explain the process of non–destructive testing of materials using ultrasonic waves by pulse echo overlap method.

3. Exemplify the increase in the acoustic intensity level when the sound intensity is doubled

COURSE OUTCOME 4: Demonstrate an understanding of several key areas of crystal physics (Understand)

1. Estimate the atomic packing factor for SC, BCC & FCC structures.
2. Classify the types of the defects present in the crystal.

COURSE OUTCOME 5: Identify different types of material processing techniques for advanced materials. **(Understand)**

1. Explain the preparation, types, properties and application of metallic glasses.
2. Describe the properties and applications of shape memory alloys.
3. Discuss briefly about the working of pulsed laser method used for nanoparticle deposition.

21CY1401	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

Preamble

To enable the students to acquire knowledge in the concepts of chemistry for engineering applications and to familiarize the students with different application oriented topics like electrochemistry, corrosion prevention methods, significance of alloys, benefits of renewable energy sources, engineering materials, desalination etc., which enable them to develop abilities and skills that are relevant to the study and practice of engineering chemistry.

Prerequisites for the course

Basic theoretical concepts of Chemistry in higher secondary level.

Objectives

1. To inculcate sound understanding of water quality parameters and water treatment techniques.
2. To make the students familiar with the principles of electrochemistry and corrosion.
3. To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
4. To have a thorough understanding on the principles and generation of energy in batteries, nuclear reactors, solar cells, windmills, fuel cells and supercapacitors .
5. To make the students learn the basics of polymer chemistry, composites and nanomaterials.

UNIT I	WATER AND ITS TREATMENT	9

Hardness of water – Types – Expression of hardness – Units – Estimation of hardness of water by EDTA –Municipal water treatment- Boiler troubles (scale and sludge) – Treatment of boiler feed water – Internal treatment (phosphate and calgon conditioning)-External treatment – Ion exchange process- Desalination of brackish water - Reverse Osmosis.

UNIT II	ELECTROCHEMISTRY AND CORROSION	9

Electrodes- types, Cells- types, Construction (Daniel cell) - Electrode potential- Photo electrochemical cell-working and applications – Nernst equation and its applications- Emf series & its applications.

Corrosion- Causes- Types- Chemical, Electrochemical corrosion (galvanic, differential aeration), Corrosion control – Material selection and design aspects – Electrochemical protection – Sacrificial Anode cathodic Protection method.

UNIT III	PHASE RULE AND ALLOYS	9

Phase rule: Introduction, definition of terms with examples, One component system -Water system - Reduced Phase rule - Two component systems - Lead-Silver system – Pattinson's process.

Alloys: Introduction- Properties of alloys- Significance of alloying, Nichrome and Stainless steel (18/8) – Heat treatment of steel.

UNIT IV	**ENERGY SOURCES AND STORAGE DEVICES**	**9**

Nuclear fission - Nuclear fusion - Differences between nuclear fission and fusion - Nuclear chain reactions - Nuclear energy - Light Water Nuclear Power Plant - Solar energy conversion - Solar cells - Wind energy.

Batteries & Fuel cells: Types of batteries – Primary battery (dry cell) Secondary battery (lead acid battery, lithium-ion-battery) Lithium ion battery – Electric Vehicles – working principles ,Fuel cells – H_2-O_2 fuel cell and microbial fuel cell; Supercapacitors: Storage principle, types and examples.

UNIT V	**ENGINEERING MATERIALS**	**9**

Polymers: Classification of Polymers – Preparation, properties and uses of Teflon and Nylon 6,6-Benefits and Applications. Composites: Introduction: Definition & Need for composites; Properties and applications of Polymer matrix composites and hybrid composites.

Nanomaterials: Types of nanomaterials;properties and uses of nanoparticle, nanocluster, nano rod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, chemical vapour deposition and electrochemical deposition methods. Applications of nanomaterials in medicine, agriculture, energy and electronics.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
WRITTEN TEST	ASSIGNMENT & ONLINE QUIZZES	WRITTEN TEST

Outcomes

Upon completion of the course, the students will be able to:

1	Infer the quality of water parameters from quality parameter data and propose suitable methodologies to treat water. (Remember)
2	Identify and apply the basic principles of electrochemistry and corrosion. (Understand)
3	Identify suitable alloys for material analysis. (Remember)
4	Identify different forms of energy resources and apply them in suitable energy sectors. (Apply)
5	Recognise and apply basic knowledge on polymers and nanomaterials to futuristic material fabrication needs. (Understand)

Text Books

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2018
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2018

Reference Books

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2018.
4. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
5. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
6. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

Web Resources

1. NPTEL Course https://www.digimat.in/nptel/courses/video/121106014/L01.html
2. Mod-06 Lec-36 Fundamentals of Electrochemical Techniques https://www.youtube.com/watch?v=l2ENx_Y0dNU

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	1		1	1					1		
2	3	2	2	1		1	1					1		
3	3	1	1	1		1	1					1		
4	3	2	2	1		1	1					1		
5	3	2	2	1		1	1					1		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	30	30	10	10	30

UNDERSTAND	30	30	10	10	30
APPLY	20	20	5	5	20
ANALYZE	20	20	0	0	20
EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0
	100	100	25	25	100

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to infer the quality of water parameters from quality parameter data and propose suitable methodologies to treat water. (Remember)

1. How is the exhausted resin regenerated in an ion exchanger?
2. Suggest your valuable ideas to protect the boiler from corrosion.

COURSE OUTCOME 2: Students will be able to identify and apply the basic principles of electrochemistry and corrosion. (Understand)

1. Compare the mechanisms involved in electrochemical cells and electrolytic cells.
2. How corrosion is prevented by sacrificial anode cathodic protection methods.

COURSE OUTCOME 3: Students will be able to identify suitable alloys for material analysis. (Remember)

1. Illustrate phase, component and degree of freedom with example
2. Will stainless steel rust? Justify.

COURSE OUTCOME 4: Students will be able to identify different forms of energy resources and apply them in suitable energy sectors. (Apply)

1. Is it safe to utilize wind energy for domestic purposes? How are commercial wind farms developed and how can I get a wind farm on my property?
2. Critically analyze nuclear power technology in terms of environmental and health safety. Draw a general layout of the Light water nuclear reactor and explain its components.

COURSE OUTCOME 5: Students will be able to recognise and apply basic knowledge on polymers and nonmaterials to futuristic material fabrication needs. (Understand)

1. What do you feel the repercussions are for extended life through utilization of nanotechnology?
2. Give an account of the preparation properties and uses of Teflon and nylon 6,6.

21HS1101	ENGLISH FOR PROFESSIONAL COMMUNICATION	L	T	P	C
		2	0	1	3

Preamble

This course is offered to equip students with the necessary skills to listen, read, write, and speak so as to comprehend and successfully convey any idea, technical or otherwise, as well as give them the necessary polish to become persuasive communicators.

Prerequisites for the course

The prerequisite knowledge required to study this Course is the basic knowledge in English Language.

Objectives

1. To develop listening skills, and enhance the ability of comprehending.
2. To communicate confidently in varied real life situations.
3. To widen the basic reading skills of the first year Engineering and Technology students.
4. To master vocabulary, sentence structure and to write articles.
5. To create emotional awareness.

Module I	SHARING BASIC INFORMATION	12

Listening - Listening to basic technical concepts, short formal and informal conversations; Speaking- Formal Self-Introduction – Etiquette – Phrases to be used highlighting the characteristics, strengths and weaknesses - Conversation Practice; Reading - short comprehension passages on fundamental concepts, principles, and ideas that helps to understand the need of Technology in a rapidly changing global environment; Writing - restructuring sentences from the jumbled words – creating coherence; Language development - Framing Yes/No questions, Question tag, Vocabulary development - formation of words– verb – Noun – Adjectives, Standard Abbreviations related to Engineering.

Suggested Activities	Evaluation Method
i) Listening to Conversations/ technical concepts from suggested app/prescribed modules - Submission of 5 Recorded Conversations.	i) Listening & Speaking: Submitted Conversation will be assessed for a) Language style as that of the sample audio. b) Pronunciation c) Intonation

ii) Introducing oneself to the audience in a professional way - Video Recording to be submitted. iii) Reading 3 Passages on Technology and answering questions through Google forms. iv) Rearranging Jumbled words - Exercises v) Teaching of Grammar Contents	ii) Introduction: Submitted Video Recording will be assessed for a) Communication Etiquette b) Language Style c) Sentence Construction Activities iii to v will be assessed through Google form tests/ written tests.

Module II	**SHARING TECHNICAL INFORMATION**	**12**

Listening - Listening to technical lectures by native speakers; Speaking - introducing a device/gadget to the audience – giving importance to its specifications, descriptions, merits and demerits; Reading - extensive reading – short narratives and news items from newspapers related to technology; Writing - sentence structure – short passages / reviews on any gadget – describing an electronic/ mechanical gadget, importance of punctuation, organizing paragraphs; Language development - framing 'Wh' Questions, writing a complete sentence using the fragments given; Vocabulary development- prefix and suffix.

Suggested Activities	Evaluation Method
i) Listening to Technical Lectures - Suggested Youtube channels a) Learn Engineering b) Jared Owen c) Interesting Engineering d) Practical Engineering	i) Listening skills will be tested through a) MCQs - Google Forms - 3 Sets b) Quiz - Polling - 2 set
ii) Speaking / Submitting video recording / classroom presentation about an electronic/electrical/ a mechanical gadget giving importance to its specifications, descriptions, merits and demerits.	ii)Speaking: Submitted Video Recording/Presentation during class hours will be assessed for a) Language Style & Fluency b) Creation of Google Slides / Canva Slides c) Content delivery
iii) Reading articles from Newspaper/ Google News / Times Now / and other Tech	Activities iii to v will be assessed through Google

News Sites iv) Writing reviews of a product v) Teaching of Grammar Contents	form tests/ written tests.

Module III	**UNDERSTANDING TECHNOLOGY**	**12**

Listening - listening to technical talks on emerging trends and filling in the blanks – cloze test; Speaking - asking for opinions about technical gadgets – presentation of reviews on electronic/electrical/mechanical/software products; Reading - Reading Comprehension – technical passages – Articles from journals; Writing - rearranging jumbled sentences, writing short essays; Language development - Direct Speech and Indirect Speech – Framing Indirect – Questions - Prepositions – Articles; Vocabulary development – Select Single Word Substitutes used in Engineering.

Suggested Activities i) Listening to Technical talks on emerging trends - Suggested YouTube channels a) Bernard Marr b) Concerning Reality c) Ideas and Inspiration ii) Speaking / Submitting video recording / classroom presentation on giving reviews about a product. iii) Reading articles -Extracts from reputed journals. iv) Writing essays and rearranging Jumbled Sentences. v) Teaching of Grammar Contents	Evaluation Method i) Listening skills will be tested through a) Cloze Test - 2 Sets ii)Speaking: Submitted Video Recording/Classroom presentation will be assessed for a) Inquisitiveness b) Analytical skills c) Presentation Skills Activities iii to v will be assessed through Google form tests/ written tests.

Module IV	**STATING PROBLEMS AND EXPRESSING SOLUTIONS**	**12**

Listening- listening to talks relating to technology and noting down the merits and demerits; Speaking - stating a problem and expressing solutions giving more focus on pronunciation of words and sentence structure; Reading - comprehending Articles from Magazines – Identify the problem statement and note down solution statements; Writing - Identifying problems – Writing problem statement, Analyzing the situation – Gathering information related to the problem stated – Identifying solution criteria – Choosing the best solution – Implementing a solution – writing solution content - Measuring solution success – Report preparation – White paper writing – Release/launch notes; Language development- Tenses; Vocabulary development- Synonyms, Antonyms, Phrasal Verbs.

Suggested Activities i) Listening to talks related to Technology - Suggested YouTube channels a) Auto Car India b) Lesics c) Student Energy ii) Speaking / Submitting video recording / Classroom presentation on Technical issues faced in a gadget and expressing suitable solutions. iii) Reading articles -Extracts from reputed journals and identify problem statements and solution statements. iv) Writing - Identifying problems and giving solutions v) Teaching of Grammar Content	Evaluation Method i) Listening skills will be tested through a) Note making - 2 Sets ii)Speaking: Submitted Video Recording / Classroom Presentation will be assessed for a) Expression of Innovative Ideas and Solution b) Sentence Structure Activities iii to v will be assessed through Google form tests/ written tests/ written exercises.

Module V	**EMOTIONAL AWARENESS AND MANAGEMENT**	**12**

Listening - Listening Types - Appreciative listening – Critical Listening – Relationship Listening; Speaking - presentation on the importance of Emotional Intelligence; Reading- Reading Articles on High Level Cognition - Cognitive Control – Decision Making – Social Behaviour – Emotion – Language and Consciousness; Writing - Articulate emotions using the right language - Balance optimism and pessimism to effectively impact others; Language development - modal verbs; Vocabulary Development - Fixed and Semi-Fixed Expressions.

Suggested Activities	Evaluation Method
i) Watching videos on types of Listening	i) Listening skills will be tested through a) Google form test- 2 Sets
ii) Presentation on Emotional Intelligence	ii)Speaking: Submitted Video Recording / Classroom Presentation will be assessed for a) Emotional awareness b) Communication Skills
iii) Reading Articles on High Level Cognition	
iv) Writing - Articulate emotions using the right language - Balance optimism and pessimism to effectively impact others	Activities iii to v will be assessed through Google form tests/ written tests/ written exercises.
v) Teaching of Grammar Contents	

S.No	List of Exercises	CO
1.	Conversation Recording using the suggested app	CO 1
2.	Self Introduction Video	CO 1
3.	Listening Test - Google Form	CO 2
4.	Presentation on the working principle of a gadget	CO 2
5.	Listening - Cloze Test	CO 3
6.	Reviewing a Product - Video Submission	CO 3
7.	Listening and Note Making	CO 4
8.	Talk on technical issues in a gadget and express suitable solutions.	CO 4
9.	Types of Listening - Google Form	CO 5
10.	Presentation on Emotional Intelligence	CO 5
Total Periods		30 Theory +30 Lab

Laboratory Requirements for a batch of 60 Students

Software: Globarena

1. Teacher console and 30 systems for students.

2. English Language Lab Software

3. Career Lab Software

Suggestive Assessment Methods:

1) Listening and answering questions - MCQ - Cloze Test - Note Making
2) Speaking - App/Software based testing
3) Reading - analyze the passage given - understand the concept and answer Questions - On-line Based
4) Written Tests

Continuous Assessment Test (30 Marks)	**Lab Components Assessments (20 Marks)**	**End Semester Exams (50 Marks)**
Written Examination	Completion of Suggested Exercises	Written Examination

Outcomes

Upon completion of the course, the students will be able to:

CO 1	Enumerate basic information using communication etiquette on par with international communication standards.
CO 2	Interpret fundamental technical concepts in English language giving importance to syntax.
CO 3	Evaluate advanced varied technical concepts in the current scenario and emerging trends to invent new concepts.
CO 4	Write solutions for problems identified using the exact vocabulary and structure without grammatical errors as expected by the corporate world.
CO 5	Manage and respond to self, others' emotions using skills of Self Awareness, Self Management, Self Motivation, Empathy & Social Relations to be an Emotionally Intelligent Human Being.

Text Books

1. Butterfield, Jeff. Soft Skills for Every one. Cengage Learning: New Delhi,2017.
2. Sudharshana.N.P and Saveetha. C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

Reference Books

1. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
2. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges.

Web Resources

1. Self Introduction: https://youtu.be/Osa53-RYBk4
2. Working Principle of a Gadget: https://www.youtube.com/channel/UC6qf8AGvAGixZXWdxapvCqw
3. Product Review: https://youtu.be/ByhA05x7CWI
4. Times of India: https://timesofindia.indiatimes.com/home/headlines
5. Listening to Technical talks:
   Auto Car India https://m.youtube.com/user/autocarindia1

   Lesics : https://www.youtube.com/channel/UCqZQJ4600a9wIfMPbYc60OQ

   Student Energy https://www.youtube.com/user/studentenergy?app=desktop
6. Types of Listening https://www.youtube.com/watch?v=22gzvSindTU&t=1s

CO Vs PO Mapping and CO Vs PSO Mapping

CO	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
1				2				2	1	3	2	2			
2	1	1		1				1	2	3	2	2			
3	1	1		1			2	1		2	2	2			
4	1	1		1				2		2	2	2			
5						1	1	2	2	3		2			

Assessment Pattern

BLOOM'S CATEGORY	ASSESSMENT TESTS				END SEMESTER EXAMINATION
	CAT – 1	CAT -2	FAT - 1	FAT - 2	
REMEMBER	10	10	5	5	10
UNDERSTAND	30	30	10	10	30
APPLY	60	60	10	10	60
ANALYZE	0	0	0	0	0
EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0

SUGGESTED COURSE LEVEL ASSESSMENT QUESTIONS:

COURSE OUTCOME 1 (CO 1) : Enumerate basic information using communication etiquette on par with international communication standards.

1) Listen to the talk on basic technical topics and answer the questions provided.
2) Introduce yourself in a professional way highlighting Characteristics, Strengths & Weaknesses.
3) Converse with your friend on any fundamental concepts in Technology.
4) Read the given technical passage and answer the questions provided.
5) Frame Yes/No Questions for the statements given.
6) Frame Question tags for the statements given.
7) Rearrange the jumbled words into a meaningful sentence.
8) Complete the sentence with the Noun form/ Verb Form/ Adjective form (as Directed) of the word given.
9) Give the expansion of the Abbreviations given.

COURSE OUTCOME 2 (CO 2) : Interpret fundamental technical concepts in English language giving importance to syntax.

1) Listen to the technical lecture and answer the questions provided.
2) Introduce a device or a gadget to the class giving importance to its specifications, description, merits and demerits.
3) Read the given passage / short narrative / article from a journal or newspaper to the class.
4) Write your review on any one of the gadgets you are using.
5) Frame "Wh" Questions for the statements given.
6) Punctuate the following statement given.
7) Complete the sentence using the fragments given.
8) Write a short passage on the given topic.
9) Fill in the blanks with the suitable prefix or suffix as directed.

COURSE OUTCOME 3 (CO 3) :Evaluate advanced varied technical concepts in the current scenario and emerging trends to invent new concepts.

1) Listen to the technical talk on the emerging trends and complete the statements given. (Cloze Test)
2) Ask questions to get an opinion about technical gadgets / software / devices
3) Read the given article from a journal and provide your ideas for further developments.
4) Rearrange the following sentences in the proper chronological order.
5) Write a short essay on any one of the given technical topics highlighting the future scope of the product.
6) Rewrite the following into Indirect Speech.
7) Frame indirect questions for the questions given.
8) Fill in the blanks with the suitable articles.
9) Give the one word substitutes for the given statement.

COURSE OUTCOME 4 (CO 4) : Write solutions for problems identified using the exact vocabulary and structure without grammatical errors as expected by the corporate world.

1) Listen to the technical talks and write down the merits and demerits of the product discussed.
2) Watch the video, evaluate the concept and express your solutions to the problem.
3) Read the given article and note down the problems stated.
4) Write down solutions for the problems faced while using a product.
5) Draft a white paper writing for the given situation..
6) Write launch notes for a product.
7) Convert the given statement to another form of the tenses as directed.
8) Pick out the suitable synonym for the underlined word in order to minimize plagiarism.
9) Fill in the blank with the suitable phrasal verb.

COURSE OUTCOME 5 (CO 5) : Manage and respond to self, others' emotions using skills of Self Awareness, Self Management, Self Motivation, Empathy & Social Relations to be an Emotionally Intelligent Human Being.

1) Watch the video on Types of listening and answer the questions.
2) Make a presentation on the importance of Emotional Intelligence.
3) Read the given article on High level cognition and answer the questions.
4) Read the article on social behaviour and redraft it in your own style.
5) Comprehend the passage and give your inputs for decision making.
6) Watch the video and articulate your emotions using appropriate words.
7) Write a note on optimism and pessimism.
8) Fill in the blank with the suitable modal verb.
9) Pick out the suitable fixed/ semi-fixed expression to complete the given statement.

21CS1514	C PROGRAMMING	L	T	P	C
		2	0	2	3

Prerequisites for the course

- Basic Problem-solving ideas, Analytical and Logical thinking

Objectives

1. To learn the basic constructs of C Programming.
2. To learn arrays and strings concepts of C Programming.
3. To learn functions and pointers in C and use pointers for storing data in the main memory efficiently.
4. To learn structures and union concepts of C Programming
5. To learn file processing functions

UNIT I	BASICS OF C PROGRAMMING	6

Structure of a 'C' program - C Tokens: Constants, Variables – Data Types: Primitive Data Types, Type Definition, Operators and Expressions- Managing Input and Output operations

UNIT II	CONTROL STATEMENTS AND ARRAYS	6

Decision Making: Branching statements, Looping statements- Arrays: Declaration, Initialization, One dimensional, Two dimensional, and Multidimensional arrays.

UNIT III	STRINGS, FUNCTIONS AND POINTERS	6

String: String operations – Function: Declaration, Definition, Parameter passing methods, Recursion – Pointers: Declaration, Definition, Pointers and Functions

UNIT IV	STRUCTURE AND UNION	6

Structure and union - Nested structures – Pointer and Structures – Array of structures – Example Program using structures and pointers

UNIT V	FILE PROCESSING	6

Files – file input output -Types of file processing: Sequential access, Random access

S.No	List of Experiments	CO
1	Programs using simple statements	CO1
2	Programs using decision making statements	CO2
3	Programs using looping statements	CO2
4	Programs using one dimensional and two-dimensional arrays	CO2
5	Programs using strings.	CO3

6	Programs using user defined functions and recursive functions	CO3
7	Programs using functions and pointers	CO3
8	From a given paragraph perform the following using built-in functions: a. Find the total number of words. b. Capitalize the first word of each sentence. c. Replace a given word with another word.	CO3
9	Sort the list of numbers using pass by reference.	CO3
10	Generate salary slip of employees using structures and pointers.	CO4
11	Compute internal marks of students for five different subjects using structures and unions.	CO4
12	Programs usingSequential access files	CO5
	Total Periods	**30 Theory +15 Lab**

Laboratory Requirements

- C compiler
- System with windows

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Lab components (20 Marks)**	**End Semester Practical Exams (60 Marks)**
1. Solving problems in software	1. Completing Experiments in software	1. Completing Experiments in software

Outcomes

Upon completion of the course, the students will be able to:

CO1 Develop simple applications in C using basic constructs
CO2 Design applications using control statements and arrays
CO3 Develop and implement applications in C using functions and pointers and use pointers for storing data in the main memory efficiently.
CO4 Develop applications in C using structures and union.
CO5 Design applications using file processing

Text Books

1. ReemaThareja, "Programming in C",Oxford University Press, Second edition, 2016
2. Beecher K. Computational Thinking: A beginner's guide to Problem-solving and Programming. BCS Learning & Development Limited;2017.
3. Anita Goel and Ajay Mittal , "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt.Ltd., Pearson Education in South Asia,2011.

Reference Books

1. Byron Gottfried. Programming With C. Fourth Edition, McGrawHill, 2018.
2. Paul Deital , Harvey deital, "C How to Program" , 8th Edition , Pearson,2016
3. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2016.

Web Resources

1. https://www.programiz.com/c-programming
2. https://nptel.ac.in/courses/106105171/
3. https://www.digimat.in/nptel/courses/video/106105171/L01.html

CO Vs PO Mapping and CO Vs PSO Mapping

CO	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
1	3	3							1	2		1		
2	3	3	3					2	1			1		
3	3	3	1	1				2	1			1		
4	2	3	3	2	2		2		1	2				
5	1	2	2	2	3				1					

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS	CAT 1	CAT 2	FAT 1	FAT 2	END SEM
Remember	20	10	5	5	10
Understand	40	20	10	10	20
Apply	40	50	5	5	50
Analyze		20	5	5	20
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to Predict the suitable method for…. (Apply)

Course Outcome 1 (CO1):

1. Recall the list of symbols used in flowcharts for various purposes. (Remember)

2. Summarize the steps involved in exchanging values of variables. (Understand)
3. Choose proper selection control structures to solve area of rectangle, triangle and circle. (Apply)

Course Outcome 2 (CO2):

1. What is the use of an array? (Remember)
2.Show the general form of a typical decision-making structure found in C programming language. (Understand)

Course Outcome 3 (CO3):

1. Narrate how to apply user-defined function. (Understand)
2. Write an algorithm for linear pattern searching. (Apply)
3. Develop an algorithm for comparing two strings. (Apply)

Course Outcome 4 (CO4):

1.Point out the meaning of array of structures. (Apply)
2. How many bytes in memory taken by the following C structure? (Remember)

```
#include <stdio.h>
struct test
{ int k;
char c;
};
```

Course Outcome 5 (CO5):

1. Develop a C program to create a text file to store records of addresses of N persons and retrieve and display the records with city="Tirunelveli". (Apply)
2.Develop a C program to find average of numbers stored in sequential access file. (Apply)

21PY1311	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

Preamble

The aim of this course is to make the students gain practical knowledge to co-relate with the theoretical studies and develop their practical applications in engineering materials by using the principles in the right way to implement in modern technology.

Prerequisites

Basic practical concepts of Physics and Chemistry in higher secondary level.

Objectives

- To understand the measurement techniques and usage of instruments in physics.
- To demonstrate competency and understanding of the basic concepts found in experimental Physics.
- To learn about the various electronic communication mechanisms and their usage in a practical manner.
- To make the students acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To develop an understanding about the range and uses of analytical methods in chemistry.

PHYSICS

S. No	List of Experiments (Any Five)	CO
1	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.	**3**
2	Determination of band gap of a Semiconductor (Forbidden energy band gap kit).	**1**
3	Determination of planck's constant and work function using the principle of photoelectric effect	**5**
4	Determination of Young's modulus of the material-Non Uniform bending method.	**5**
5	Determination of thermal conductivity of a bad conductor – Lee's Disc method.	**4**
6	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.	**1**
7	Determination of wavelength of spectral lines using grating – Spectrometer.	**2**
CHEMISTRY (Any Five)		
1	Determination of total, temporary & permanent hardness of water by EDTA method.	**1,5**

2	Corrosion experiments – weight loss method.	**3,5**
3	Estimation of iron content of the given solution using potentiometer.	**2**
4	Conductometric titration of strong acid vs strong base.	**2**
5	Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.	**4**
6	Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.	**1,5**
7	Determination of strength of given hydrochloric acid using pH meter.	**2**

List of Projects (PHYSICS)

S. No.	**List of Projects**	**Related Experiment**	**CO**
1.	To study Infrared radiation emitted by different sources using phototransistors.	3	1
2	To study the variations, in current flowing in a circuit containing a LDR, because of a variation: (a) In the power of the incandescent lamp, used to 'illuminate' the LDR. (Keeping all the lamps at a fixed distance). (b) In the distance of an incandescent lamp, (of fixed power), used to 'illuminate' the LDR.	2	3
3	Design a circuit for cool automatic timer controlled Light which controls vehicle traffic passing through the intersection of two or more roadways by giving a visual indication to drivers when to proceed, when to slow , and when to stop using LED and 4017 counter IC along with the 555 timer.	2	3
4	Design and implement a circuit which anyone can make at home to save their home from thefts using the light has high intensity, monochromatic, directional and coherent in nature.	4	2
5	Construct a household circuit consisting of three bulbs using a dual switching method.	1	3
6	Using ultrasonic sensor, design a ultrasonic distance finder using 8051	9	1
7	Design a water level indicator by connecting a Buzzer, resistor and transistor in series and connect this in parallel to LED.	2	3

List of Projects (CHEMISTRY)

1	Water Analysis : Analysis of perennial Thamirabarani River water samples collected from various locations (before and		

	after blending of industrial waste water). i) Determination of various physical and chemical parameters (Hardness, pH,TDS, Alkalinity) of different water samples. ii) From the result, give a detailed report about the water sample whether it is fit/unfit for domestic and industrial purposes.	1, 6	4
2.	Water Quality Monitoring : Analysis of ground water samples collected from various districts (Tirunelveli, Madurai, Tuticorin, Kanyakumari, Tenkasi etc.,). i) Determination of various physical and chemical parameters (Hardness, pH, TDS, Alkalinity) of different water samples. ii) From the result, give a detailed report about the water sample whether it is fit/unfit for domestic and industrial purposes.	1,6	4
3.	Household Plumbing Deterioration Monitoring : Study of Conductivity of domestic water (Home) by Arduino method to track the deterioration of household plumbing. i) From the observations give a detailed report about the existence of various ions in water. ii) Give an explanatory report on tracking the deterioration in household plumbing.	4	5
4	Air quality monitoring : Study of air pollution in Nellai smart city in the early morning, noon and evening due to CO/CO2 emissions by Arduino method. i) From the observations give a detailed report about the impact of air pollution on human health. ii) Deduce an explanatory report on environmental impact due to CO/CO2 emissions.	4,10	5
5.	Food adulteration : Investigation of adulterants in various food stuffs (milk, chilli powder, turmeric powder, wheat flour, honey and ghee) by Chemical methods. i) Give a report on the presence of adulterants in the given food samples. ii) From the observations give a brief report about the impact of food adulteration on human health.	1	4

Lab Assessment	
Lab Components Assessments (50 Marks)	**End Semester Exams (50 Marks)**

Outcomes	
Upon completion of the course, the students will be able to:	
CO1	Understand measurement technology, usage of new instruments and real time applications in engineering studies.(Understand)
CO2	Operate different instruments and be capable of analysing the experimental results. (Analyse)
CO3	Applying basic knowledge to design various circuits (Apply)
CO4	Have knowledge and will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters. (Apply)
CO5	Gain knowledge and will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems. (Apply)

Reference Books (Physics)

- Physics Laboratory Manual, Department of Physics, Francis Xavier Engineering College, Tirunelveli.
- A Textbook of Engineering Physics Practical ,UNIVERSITY SCIENCE PRESS (An Imprint of Laxmi Publications Pvt. Ltd.)2nd edition.

Reference Books (Chemistry)

J.Mendham, R.C. Denney, J.D.Barnes, M.Thomas and B.Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (5th edition 2009).

Web Resources

Virtual Lab - https://bop-iitk.vlabs.ac.in/basics-of-physics/List%20of%20experiments.html
Young's Modulus- https://vlab.amrita.edu/?sub=1&brch=280&sim=550&cnt=1
Virtual Lab - https://www.vlab.co.in/ba-nptel-labs-physical-sciences
Numerical Aperture - https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1
Water Quality standards - https://www.youtube.com/watch?v=OlGllOZlIyI

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO	PO	PO	PSO 1	PSO 2

										10	**11**	**12**		
1	3	2	1	1	1		1	1	1		1	1		
2	3	2	1	1	1		1	1	1		1	1		
3	3	2	1	1	1		1	1	1		1	1		
4	3	2	1	1	1		1	1	1		1	1		
5	3	2	1	1	1		1	1	1		1	1		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: The students will be able to understand measurement technology, usage of new instruments and real time applications in engineering studies (Understand)

1. Find the Young's modulus of the material of a beam using Non-Uniform bending method. (Given : Thickness of the beam d = 6.35 mm)

COURSE OUTCOME 2: The students will be able to operate different instruments and be capable of analysing the experimental results (Analyse)

2. Using a given laser source and grating (i) determine the wavelength of the given laser light source and also using a given laser source and glass plate (ii) determine the average size of the particles of lycopodium powder by diffraction method.
3. Determine the thermal conductivity of a given bad conductor (Glass) using Lee's disc method. (Given: M= 800 $X10^{-3}$ Kg, S = 370 $JKg^{-1}K^{-1}$).

COURSE OUTCOME 3: The students will be able to applying basic knowledge to design various circuits (Apply)

1. **Design a circuit for finding unknown resistance and specific resistance of a given coil of wire.**
2. Find the energy band gap of semiconductor diode.

COURSE OUTCOME 4: The students will be able to have knowledge and will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters. (Apply)

1. Estimate the amount of total hardness present in 250ml of the given water sample by EDTA method. You are provided with a standard hard water of strength 0.01N.What is the permissible limit of hardness in drinking water.
2. Calculate the amount of total alkalinity present in 500ml of the given water sample. You are provided with a standard NaOH solution of strength 0.01N.

   What is the permissible limit of alkalinity in drinking water?

COURSE OUTCOME 5: The students will be able to gain knowledge and will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.(Apply)

1. Determine the amount of NaOH present in 1000 ml of the given sample solution by pH metry. What is the pH of a blood sample?
2. Find the amount of HCl and CH3COOH present in 1000 ml of the given sample solution by Conductometry. Which Acid Is The Best Conductor Of Electricity?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF WEEKS REQUIRED
1	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.	**1**
2	Determination of band gap of a Semiconductor (Forbidden energy band gap kit).	**1**
3	Determination of planck's constant and work function using the principle of photoelectric effect.	**1**
4	Determination of Wavelength, and particle size using Laser	**1**
5	Determination of Numerical aperture and acceptance angle in an optical fiber	**1**
6	Determination of Young's modulus of the material-Non Uniform bending method.	**1**
7	Determination of rigidity modulus – Torsion pendulum.	**1**
8	Determination of thermal conductivity of a bad conductor – Lee's Disc method.	**1**
9	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.	**1**
10	Determination of wavelength of spectral lines using grating – Spectrometer.	**1**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
1	3		1			2	2					2		
2	3	1	2			1	2					1		
3	3	2	1	1			1					1		
4	2	1	2			2	2					1		
5	2	1	2		1	2	2					1		

1-Low , 2- Medium, 3- High

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF WEEKS REQUIRED
1	Determination of total, temporary & permanent hardness of water by EDTA method.	1
2	Corrosion experiments – weight loss method	1
3	Estimation of iron content of the given solution using potentiometer	1
4	Conductometric titration of strong acid vs strong base	1
5	Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer	1
6	Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample	1
7	Determination of strength of given hydrochloric acid using pH meter.	1
8	Preparation of nanoparticles (TiO2/ZnO/CuO) by Sol Gel method.	1

9	Estimation of sodium and potassium present in water using a flame photometer.	1
10	Determination of strength of acids in an acid mixture using conductivity meter.	1

SEMESTER II

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS2101	English for Technical Communication	HSSM	2	2	0	0	2
2	21MA2201	Partial Differential Equation and Application of Fourier Series	BS	4	3	1	0	4
3	21EE2503	Fundamentals of Electrical and Electronics Engineering	ES	3	3	0	0	**3**
4	21CE2501	Mechanics for Civil Engineering	ES	4	3	1	0	4
Practical cum Theory Course								
1	21ME1513	Computer Aided Engineering Graphics	ES	6	2	0	2	4
2	21CS2512	Python Programming	ES	5	1	0	2	**3**
Practical Courses								
1	21GE1512	Engineering Workshop	ES	4	0	0	4	2
			Total	**28**	**14**	**2**	**12**	**22**

21HS2101	**ENGLISH FOR TECHNICAL COMMUNICATION**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**2**

Preamble

This course is offered to develop strategies and skills to enhance professional students' ability to read and comprehend engineering and technology texts. Foster their ability to write convincing job applications and effective reports. Develop their speaking skills to make technical presentations, participate in group discussions. The outcome of the course is to help students acquire the language skills of listening, speaking, reading and writing competency in English language thereby making them meet the global expectations.

Prerequisites for the course

- The prerequisite knowledge required to study this Course is the basic knowledge in English Language.

Objectives

1. To widen strategies and skills to augment ability to read and comprehend engineering and technology texts.
2. To draft convincing job applications and effective reports.
3. To develop speaking skills to make technical presentations, participate in group discussions.
4. To strengthen listening skills to comprehend technical lectures and talks in their areas of specialization.
5. To cultivate writing skills both technical and general.

<table>
<tr><td>MODULE 1</td><td>READING AND STUDY SKILLS</td><td>6</td></tr>
<tr><td colspan="3">Reading - Reading longer technical texts and taking down notes – Note Making strategies; Writing - interpreting charts (all the types), graphs – comparing and contrasting statements/paragraphs – analysing technical details; Vocabulary Development - Select Technical Vocabulary; Language Development - Active Voice and Passive Voice</td></tr>
<tr><td colspan="2">Suggested Activities
i) Visit to the Library - Reading articles on emerging trends and taking down notes in the prescribed format - Submission through FAST FORMS - Minimum 2

ii) Writing compare and contrast statements. (Eg. Windows 10 Vs Windows 1, RPA Developer Vs RPA Analyst, Edge Computing Vs Quantum Computing) related to the programme.

iii) Teaching of Grammar Contents</td><td>Evaluation Method
i) Content & Structure

ii) Submission: Fast form Document
Submitted document will be assessed for
a) Communication Etiquette
b) Language Style
c) Sentence Construction

Activity iii will be assessed through Google form tests/ written tests.</td></tr>
<tr><td>MODULE 2</td><td>INTRODUCTION TO PROFESSIONAL WRITING</td><td>6</td></tr>
<tr><td colspan="3">Reading - Technical related topics; Writing - purpose statements – extended definitions - writing instructions – checklists – recommendations – Minutes of the Meeting ; Vocabulary Development - select Technical Vocabulary ; Language Development - Subject Verb Agreement, Compound Words.</td></tr>
<tr><td colspan="2">Suggested Activities
i) Visit to the Library - Reading articles on emerging trends and writing down purpose statements and extended definitions. Submission through FAST FORMS - Minimum 2

ii) Writing a set of 8 Instructions, Recommendations and Checklists for the suggested topics. (each 2 sets)

iii) Teaching of Grammar Contents</td><td>Evaluation Method
i) Content & Structure

ii) Submission: Fast form Document
Submitted document will be assessed for
a) Format
b) Language Style</td></tr>
</table>

	c) Sentence Construction Activity iii will be assessed through Google form tests/ written tests.

MODULE 3	**INTERVIEW SKILLS**	**6**

Listening - Listening to mock Interviews ; Speaking - answering Interview questions – GD Strategies; Reading- longer texts both general and technical, practice in speed reading ; Writing - Job Application - Resume; Writing opinion paragraph - Writing paragraphs with reasons; Language Development - If – Conditionals

Suggested Activities i) Listening to UPSC Toppers Mock Interviews. ii) Drafting Job application and Resume building. iii) Teaching of Grammar Contents	Evaluation Method i) Answering questions for Interview questions(Android app based) Responses will be assessed for a) Fluency b) Communication etiquette c) Language style ii) Submission: Fast form Document Submitted document will be assessed for a) Language Style b) Design Activity iii will be assessed through Google form tests/ written tests.

MODULE 4	**REPORT WRITING I**	**6**

Writing - Fire accident Report, Industrial Visit Report, Project Report; Vocabulary Development- finding suitable synonyms - paraphrasing ; Language Development - Clauses.

Suggested Activities i) Drafting reviews and reports on Industries - a) Profile & Products b) Trending technology adopted c) Careers d) Latest news Min - 2 Industries ii) Teaching of Grammar Contents	Evaluation Method i) Content & Structure

	Activity ii will be assessed through Google form tests/ written tests.

MODULE 5	**REPORT WRITING II**	**6**

Writing - Writing Feasibility Reports, Survey Reports, Business Report; Vocabulary Development - verbal analogies ; Language Development - advanced use of Articles, Prepositional Phrases.

Suggested Activities i) Drafting feasibility report on- a) Launching a new product / Technology Min - 2 ii) Teaching of Grammar Contents	Evaluation Method i) Content & Structure Activity ii will be assessed through Google form tests/ written tests.

Total Periods	**30**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
(i) Google Form based - on-line Test (ii) Written Test	(i) Google Form based - on-line Test incorporating Listening, Speaking and Reading	Written Test

Outcomes

Upon completion of the course, the students will be able to:

CO1	Understand advanced technical texts from varied technical genres to understand engineering concepts and explore more.
CO2	Review technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals.
CO3	Articulate appropriately in interviews and Group Discussions effortlessly following the strategies expected by the corporate world.
CO4	Write reports utilizing the required format prescribed on par with international

	standards using the exact vocabulary to make their reports worthy to be read.
CO5	Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness.

Text Books

1. Mike Markrl. Technical Communication,Palgrave Macmillan: London, 2012.
2. Sumant,S and Joyce Pereira. Technical English II. Chennai: Vijay Nicole Imprints Private Limited, 2014.
3. Kumar, Sanjay and Pushp Lata. Communication Skills: A Workbook. New Delhi: OUP, 2018.

Reference Books

1. Raman, Meenakshi & Sangeetha Sharma. Communication Skills. New Delhi: OUP, 2018
2. Rizvi M, Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill Publishing Company Limited, 2007

Web Resources

1. Interpretation of Charts : https://youtu.be/4lxA7lo9GLU : https://www.englishhints.com/charts-and-graphs.html
2. Instructions https://www.wikihow.com/Write-Clear-Instructions
3. Resume building https://novoresume.com/career-blog/how-to-write-a-resume-guide
4. Report writing - https://www.youtube.com/watch?v=FXIuHOFAxos ; https://www.deakin.edu.au/students/studying/study-support/academic-skills/report-writing
5. UPSC Interview: https://www.youtube.com/watch?v=OhJWg-0qdI0

CO Vs PO Mapping and CO Vs PSO Mapping

CO	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
1	1		1	2		2	1	1		2	1	1			
2	1			2		1		1		3	2	1			
3						3	2	1	2	3		2			
4		1	1	1		1	1	1	2	3	2	2			
5		1		1		1	1	1	1	3	2	2			

Assessment Pattern

BLOOM'S CATEGORY	ASSESSMENT TESTS				END SEMESTER EXAMINATION
	CAT – 1	CAT -2	FAT - 1	FAT - 2	
REMEMBER	10	10	5	5	10
UNDERSTAND	30	30	10	10	30
APPLY	60	60	10	10	60
ANALYZE	0	0	0	0	0
EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0

SUGGESTED COURSE LEVEL ASSESSMENT QUESTIONS:

COURSE OUTCOME 1 (CO 1) : Understand advanced technical texts from varied technical genres to understand engineering concepts and explore more.

1) Read the given passage and take notes.
2) Analyse the given type of chart or graph and answer the questions given.
3) Analyse the given chart or graph and write paragraphs comparing and contrasting the data.
4) Analyse the given chart or graph and write paragraphs giving importance to technical details.
5) Fill in the blank with appropriate technical vocabulary.
6) Convert the given active voice sentence into passive voice or impersonal passive voice.

COURSE OUTCOME 2 (CO 2) : Review technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals.

1) Write a purpose statement for the tool or gadget given.
2) Write an extended definition for the given word.
3) Write 8 instructions / recommendations on the given topic.
4) Write the Minutes of the meeting for the given meeting.
5) Fill in the blank with appropriate Subject Verb agreement.
6) Fill in the blank with suitable compound words.

COURSE OUTCOME 3 (CO 3) : Articulate appropriately in Interviews and Group Discussions effortlessly following the strategies expected by the corporate world.

1) Listening to mock interviews and answering the questions.
2) Listen to the strategies of GD and answer the given questions.
3) Read and submit a recording of technical content following the strategies of speed reading.
4) Write Job application with a cover letter for the given job description.
5) Write paragraphs expressing opinion on the given topic.
6) Fill in the blank / complete the sentence with appropriate If-Conditionals.

COURSE OUTCOME 4 (CO 4) : Write reports utilizing the required format prescribed on par with international standards using the exact vocabulary to make their reports worthy to be read.

1) Write a fire accident report for the provided incident.
2) Write an Industrial visit report.
3) Write a report on the Project work undertaken by the candidate giving importance to the current status report and the time needed for the completion of the project.
4) Find the appropriate synonym for the given word.
5) Paraphrase the given passage.
6) Fill in the blank with appropriate clauses.

COURSE OUTCOME 5 (CO 5) : Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness.

1) Write a Feasibility report for a business / project proposal given.
2) Write a survey report for the given scenario.
3) Pick out the appropriate Verbal Analogy.
4) Fill in the blank with appropriate articles.
5) Complete the sentence with appropriate Prepositional Phrases.
6) Choose the appropriate word to complete the sentence.

Course Content and Lecture Schedule

S. No	Topic	No of Hours required
	MODULE - I (6 Hrs)	
1	Note Making strategies.	**1**
2	Note Making strategies - Reading longer technical texts and taking down notes.	**1**
3	Interpreting charts - types - comparing and contrasting.	**1**
4	Interpreting charts - write statements/paragraphs – analysing technical details.	**1**
5	Select Technical Vocabulary	**1**
6	Active Voice and Passive Voice	**1**
	MODULE - II (6 Hrs)	
7	Reading Technical Topics	**1**
8	Purpose Statements – Extended Definitions	**1**
9	Checklists / Instructions	**1**
10	Recommendations	**1**
11	Minutes of the Meeting	**1**

12	Subject Verb Agreement, Compound Words.	**1**
MODULE - III (6 Hrs)		
13	Listening to mock Interviews.	**1**
14	Answering interview questions	**1**
15	Reading longer texts both general and technical, practice in speed reading	**1**
16	Job Application and Resume	**1**
17	Writing opinion paragraph	**1**
18	If – Conditionals	**1**
MODULE - IV (6 Hrs)		
19	Fire accident Report	**1**
20	Industrial Visit Report	**1**
21	Project Report	**1**
22	Finding Suitable Synonyms	**1**
23	Paraphrasing	**1**
24	Clauses	**1**
MODULE - V (6 Hrs)		
25	Feasibility Reports	**1**
26	Survey Reports	**1**
27	Reviewing Reports	**1**
28	Verbal Analogies	**1**
29	Advanced use of Articles	**1**
30	Prepositional Phrases	**1**

21MA2201	PARTIAL DIFFERENTIAL EQUATION AND APPLICATIONS OF FOURIER SERIES	L	T	P	C
		3	1	0	4

Preamble:

The course consists of topics in Complex Integration, Partial Differential Equations and Laplace Transforms with applications to various engineering problems. This course will cover the following main topics: Construction of analytic function, Taylors and Laurent's series, Poles and Residues, Half range sine series, Harmonic analysis, Fourier Series Solutions of one dimensional wave and heat flow equation and Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients.

Prerequisites for the course

21MA1201 - Matrices and Advanced Calculus

Objectives

1. To introduce to the concept of Analytical function
2. To familiarize with Complex integration
3. To introduce Fourier series analysis which is central to many applications in engineering field and its use in solving boundary value problems
4. To acquaint the student with PDE and Fourier series techniques in solving wave and heat flow problems used in various situations.
5. To improve the knowledge of Laplace transforms.

UNIT I	ANALYTIC FUNCTIONS	9+3

Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions – Harmonic function – Harmonic Conjugate - Construction of analytic function by Milne Thomson's method and bilinear transformation.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Construction of analytic function by Milne Thomson's method and bilinear transformation.

UNIT II	COMPLEX INTEGRATION	9+3

Complex numbers and its conjugate - Cauchy's integral theorem (without proof) – Cauchy's integral formulae and its higher order derivatives (without proof) and its applications – Taylors and Laurent's series – Types of Singularities – Poles and Residues – Cauchy's residue theorem (without proof).

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Taylors series, Laurent's series and Cauchy's residue theorem.

UNIT III	FOURIER SERIES	9+3

Dirichlet's conditions – General Fourier series – Change of Intervals - Odd and even functions – Half range sine series – Half range cosine series - Root mean square value – Harmonic analysis for Fourier series - Engineering Applications.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Fouries series of Odd and even functions, Half range sine and cosine series, Harmonic analysis.

UNIT IV	PDE AND APPLICATIONS OF FOURIER SERIES	9+3

Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – Fourier Series Solutions of one dimensional equation of heat conduction - Engineering Applications.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Fourier Series Solutions of one dimensional wave equation and heat conduction equation.

UNIT V	LAPLACE TRANSFORMS	9+3

Properties of Laplace Transform – Inverse transforms – Convolution theorem (Without Proof) – Partial fraction - Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only - Engineering Applications.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Laplace transform using partial fraction, Convolution theorem and solving ODE.

Total Periods	**45 + 15 = 60 Periods**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1. Descriptive Questions	1.Assignment 2. Online Quizzes	1. Descriptive Questions

Outcomes

Upon completion of the course, the students will be able to:

CO1 : Apply Cauchy-Riemann equations to problems of fluid mechanics, thermodynamics and electro-magnetic fields. (Apply)
CO2: Solve complex valued integral functions using residues. (Apply)
CO3: Construct the Fourier series expansion of the periodic function. (Apply)
CO4: Solve the problems of one dimensional wave and heat equation. (Apply)
CO5: Apply Laplace Transform technique to solve the given ordinary differential equation. (Apply)

Text Books

1. B. S. Grewal, " Higher Engineering Mathematics", 45rd edition, 2017.
2. Kreyszig.E, "*Advanced Engineering Mathematics*", John Wiley & Sons. Singapore, 15th edition, 2017.

Reference Books

1. A Textbook of Engineering Mathematics(Dr. A.P.J. Abdul Kalam Technical University, Lucknow) (For . Gautam Bhudh technical Universities ,Lucknow) January 2020
2. Advanced Engineering Mathematics , H. K. DASS, S. CHAND and Company Limited, New Delhi, 22nd revised edition, 2018.

Web Resources

1. https://youtu.be/LGxE_yZYigI
2. Analytic functions - https://youtu.be/b5VUnapu-qs https://youtu.be/8jPr6rGstYk
3. Complex Integration - https://youtu.be/4yC4IXcMKJg
4. Fourier series - https://youtu.be/LGxE_yZYigI
5. Applications of fourier series - https://youtu.be/YfGHNdVeyB4
6. Laplace Transform - https://youtu.be/c9NibpoQjDk

CO Vs PO Mapping and CO Vs PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	1				1	1			1			
2	3	2	1	1				1	1			1			
3	3	2	1	1				1	1			1			
4	3	2	1	1				1	1			1			
5	3	2	1	1				1	1			1			

ASSESSMENT PATTERN:

BLOOM'S CATEGORY	ASSESSMENT TESTS				END SEMESTER EXAMINATION
	CAT – 1	CAT -2	FAT - 1	FAT – 2	
REMEMBER	10	10	5	5	10
UNDERSTAND	30	30	10	10	30
APPLY	60	60	10	10	60
ANALYZE	0	0	0	0	0
EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1 (CO 1) : (Apply)

1. Construct an analytic function whose imaginary part is $v = e^x(x\cos y - y\sin y)$
2. Find the bilinear transformation that maps the points Z =0, -1 ,i on to the points $i, 0, \infty$.

COURSE OUTCOME 2 (CO 2) : (Apply)

1) Solve $\int \frac{e^{2z}}{(z+1)^4} dz$ using Cauchy's Integral formula where C is $|z| = 2$.
2) Compute $\int \frac{2z-1}{z(z+1)(z-3)} dz$ using Cauchy's Residue theorem where C is $|z| = 2$.

COURSE OUTCOME 3 (CO 3) : (Apply)

1) Construct Fourier series for $f(x) = x$ in $(-\pi, \pi)$.
2) Construct Fourier series for $f(x) = x^2$ in $(-l, l)$.

COURSE OUTCOME 4 (CO 4) : (Apply)

1) Identify the PDE $u_{xx} = a^2 u_{tt}$
2) A tightly stretched string with fixed end points $x = 0, x = l$ is initially at rest in its equilibrium position. If it is vibrating, giving each point a velocity $\lambda x(l - x)$. Find the displacement of the string at any time 't'.

COURSE OUTCOME 5 (CO 5) : (Apply)

1) Solve $\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 2$, given $x = 0$ and $\frac{dx}{dt} = 5$ for $t = 0$ using Laplace transform method.
2) Find the Laplace transform for $\frac{\cos at - \cos bt}{t}$.

21EE2503	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Engineering Physics
- Engineering Mathematics

Course Objectives

The course will enable students to:

- Know the basic concepts of electric circuits and analysis and introduction to measurement and metering equipments for electric circuits
- Gain knowledge on the basic operation of electric machines and transformers.
- Have an Introduction of semiconductor devices and its applications
- To understand the fundamentals of digital electronics.
- Learn about the basics of communication systems.

UNIT I	ELECTRICAL CIRCUITS	9 + 2

Ohms Law – Kirchoff's Laws – Steady State Solution of DC Circuits –Mesh and Node Analysis- Introduction to AC Circuits – Operating Principles of Moving Coil and Moving Iron Instruments, Dynamometer type Wattmeter and Induction type energy meter.

UNIT II	ELECTRICAL MACHINES	7

DC Generator - DC Motor - Single Phase Transformer - single phase induction Motor: Construction, Principle of Operation, EMF Equation and Applications.

UNIT III	SEMICONDUCTOR DEVICES AND APPLICATIONS	8

Characteristics of PN Junction Diode and Zener Diode– Half wave and Full wave Rectifier – Bipolar Junction Transistor: CB, CE, CC Configurations and Characteristics.

UNIT IV	DIGITAL ELECTRONICS	10

Number System –Number System Conversions- Introduction to logic families-RTL, DTL, TTL- Logic Gates - Half and Full Adders – Half Subtractor and Full Subtractor.

UNIT V	BASICS OF COMMUNICATION SYSTEMS	9

Types of Signals: Analog and Digital Signals – Modulation: Amplitude and Frequency Modulation-Demodulation-Communication Systems: Radio, TV, Microwave, Satellite (Block Diagram Approach only)

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)

1. Description questions 2. Formative multiple choice questions	1. Assignment 2. Online quizzes 3. Problem–solving activities	1. Description questions 2. Formative multiple-choice questions

Course Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand and apply the basics of electric circuits, analysis, measurement and metering for electric circuits.
CO2: Understand the basic operation of electric machines and transformers
CO3: Understand the utilization of semiconductor devices.
CO4: Understand the fundamentals of digital circuits.
CO5: Understand the basics of communication systems.

Text Books

1. R. Muthusubramanian, S.Salivahanan and K A Muraleedharan, "Basic Electrical, Electronics and Computer Engineering", 2nd ed., Tata McGraw Hill, 2012.
2. R.S Sedha, "Applied Electronics", S. Chand & Co., 2008.

Reference Books

1. Mittle and V. N. Mittle, "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 2005.
2. T K Nagsarkar and M S Sukhija, "Basics of Electrical Engineering", Oxford press 2005.

Web Resources

1. **https://nptel.ac.in/courses/108/104/108104139/**
2. **https://nptel.ac.in/courses/108/105/108105155/**
3. **https://nptel.ac.in/courses/108/105/108105132/**
4. **https://nptel.ac.in/courses/117/102/117102061/**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
1	3	3	3											
2	3	2				2						2		
3	3													
4	3	3	2											
5	3					2						2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	30	30	05	05	20
Understand	20	20	10	10	20
Apply	20	20	05	05	20
Analyze	20	20	05	05	20
Evaluate	10	10			20
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Understand and apply the basics of electric circuits, analysis, measurement and metering for electric circuits.

1. Calculate the equivalent resistances for the two resistance 7 ohms and 12 ohms connected in series.
   a. 7 ohms
   b. 9 ohms
   c. 12 ohms
   d. 19 ohms
2. Which equipment is used to measure the current?
   a. ammeter
   b. voltmeter
   c. wattmeter
   d. energymeter

COURSE OUTCOME 2: Understand the basic operation of electric machines and transformers

1. Which is the outermost covering of D.C machine?
   a. Yoke
   b. armature
   c. field winding
   d. commutator
2. Which is the static device?
   a. transformer
   b. DC generator
   c. DC motor
   d. Induction motor

COURSE OUTCOME 3: Understand the utilization of semiconductor devices.

1. The device which is used to convert the alternating current into direct current is known as

a. chopper
b. rectifier
c. motor
d. transistor

2. Which device is also known as voltage regulator?
   a. Zener diode
   b. PN diode
   c. motor
   d. transistor

COURSE OUTCOME 4: Understand the fundamentals of digital circuits.

1. Which number system has a base 16
   a. Hexadecimal
   b. Octal
   c. Binary
   d. Decimal
2. Which of these sets of logic gates are known as universal gates?
   a.XOR, NAND, OR
   b. OR, NOT, XOR
   c. NOR, NAND, XNOR
   d. NOR, NAND

COURSE OUTCOME 5: Understand the basics of communication systems.

1. _____ is defined as the process by which some characteristics (i.e. amplitude, frequency, and phase) of a carrier are varied in accordance with a modulating wave
   a. modulation
   b. demodulation
   c. demultiplexing
   d. none of these
2. _____ is the equipment which converts physical message, such as sound, words, pictures etc., into corresponding electrical signal.
   a. transmitter
   b. receiver
   c. channel
   d. none

21CE2501	MECHANICS FOR CIVIL ENGINEERING	L	T	P	C
		3	1	0	4

Prerequisites for the course

- Matrices and Calculus

Objectives

1. To enable students to apply fundamental laws and basic concepts of rigid body mechanics to solve problems of bodies under rest or in motion.
2. To enable the students to apply conditions of static equilibrium to analyse physical systems.
3. To compute the properties of areas and bodies.

UNIT I	STATICS OF PARTICLES	9+3

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	9+3

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 – (Descriptive treatment only)

UNIT III	DYNAMICS OF PARTICLES	9+3

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 IV	FRICTION AND RIGID BODY DYNAMICS	9+3

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction, Ladder 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.

UNIT V	PROPERTIES OF SURFACES AND SOLIDS	9+3

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.

Total Periods	**60**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Comprehend and analysis the forces in the system.
CO2: Solve problems in engineering systems using the concept of static equilibrium.
CO3: Solve problems involving kinematics and kinetics of rigid bodies in plane motion.
CO4: Solve problems involving frictional phenomena in machines.
CO5: Understand the concept of translation and rotation on a rigid body.
CO6: Determine the centroid of objects such as areas and volumes, center of mass of body and moment of inertia of composite areas.

Text Books

1. Beer, F.P and Johnston Jr. E.R, Cornwell and Sanghi ., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 11thEdition, McGraw-Hill Publishing company, New Delhi (2017).

2. N.H. Dubey, "Engineering Mechanics Statics and Dynamics", 1st Edition, McGraw-Hill Education India Private Ltd., New Delhi, (2016)

Reference Books

1. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, Wiley India,2017.

2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2015.

3. S. S. Bhavikatti, Engineering Mechanics, New Age International Publishers, 2016

Web Resources

1. https://nptel.ac.in/courses/112103109/
2. https://nptel.ac.in/courses/112106286/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1	-	-	-	-	1	1	1	-	2		
2	3	3	1	-	-	-	-	1	1	1	-	2		
3	3	3	1	-	-	-	-	1	1	1	-	2		
4	3	3	1	-	-	-	-	1	1	1	-	2		
5	3	3	1	-	-	-	-	1	1	1	-	2		
6	3	3	1	-	-	-	-	1	1	1	-	2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	10	10	10	10	10
Apply					
Analyze	80	80	80	80	80
Evaluate					
Create					

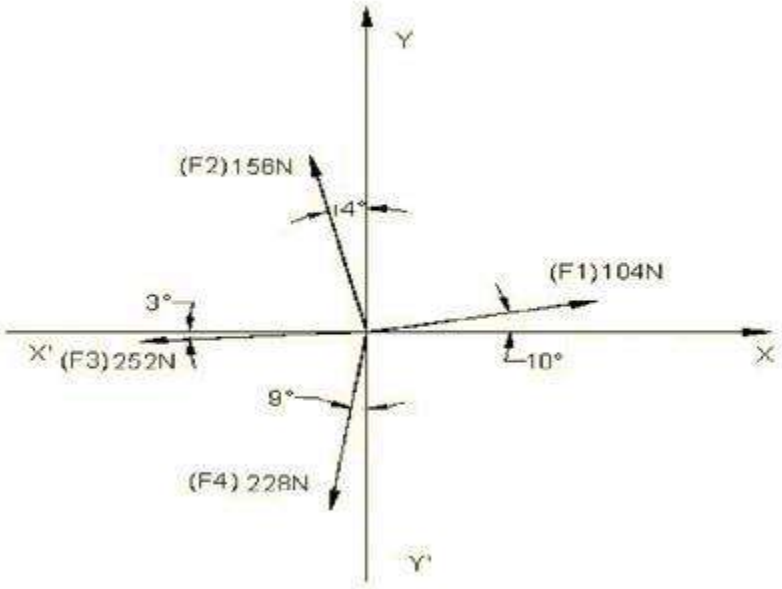
COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Two identical rollers each of weight 1000N are supported by an inclined plane

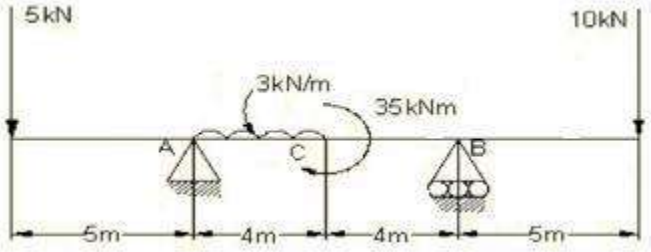
and a vertical wall as shown in fig below. Find the support reactions at points A,B&C. assume all surfaces to be smooth.

2. The four coplanar forces are acting at a point as shown in figure-1. Determine the resultant in magnitude and direction.

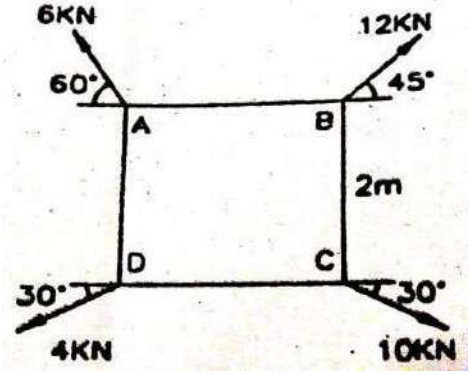


COURSE OUTCOME 2:

1. An overhanging beam is loaded as shown in figure-2. Find the support reactions of the beam when a 35kNm couple acts at C as shown.

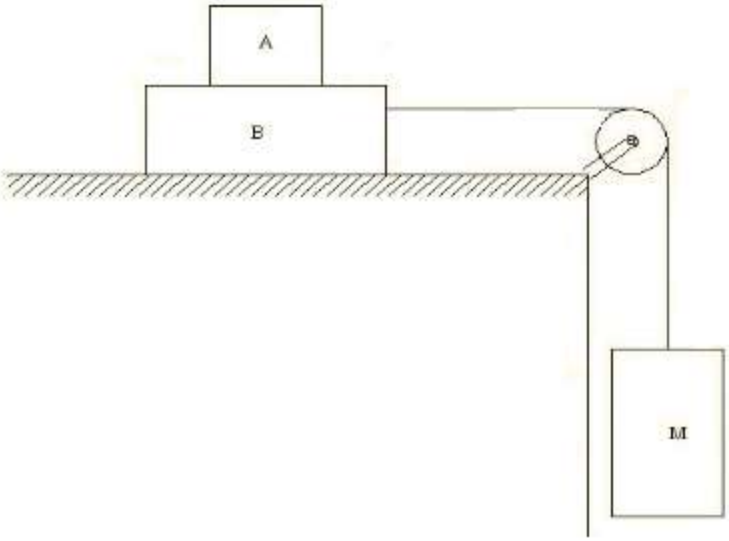


2. Find the magnitude, direction and line of action of the resultant force with respect to A, for the system shown if Figure-3 AB=CD=BC=AD=2m.



COURSE OUTCOME 3:

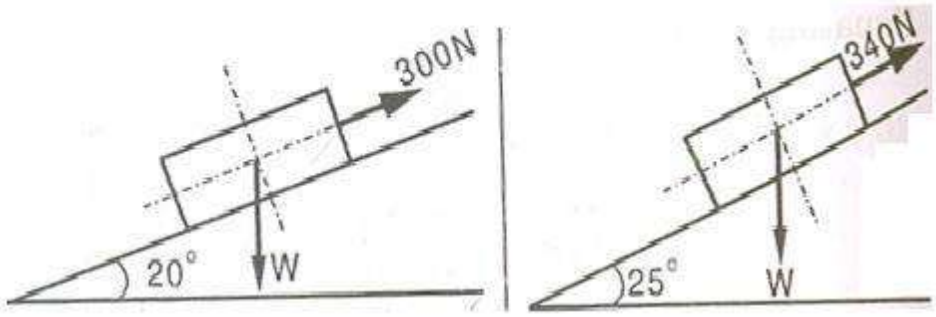
1. Two blocks A and b of masses 3 and 6kg respectively are placed one above the other on a horizontal table and connected to a suspended mass M through a frictionless pulley as shown in Figure-5. The coefficient of static friction between A and B is 0.3 and the coefficient of kinetic friction between block B and table is 0.2. Find the maximum mass of the block M in order that b accelerates over the table without A slipping over B.



2. The acceleration of a particle moving along a straight line is defined by a=8- x; The particle starts from rest at t=0 and origin x=0. Determine (a) Velocity of the particle when x=10m (b) The position of particle when velocity becomes zero. (c) Velocity of a particle when acceleration becomes zero

COURSE OUTCOME 4:

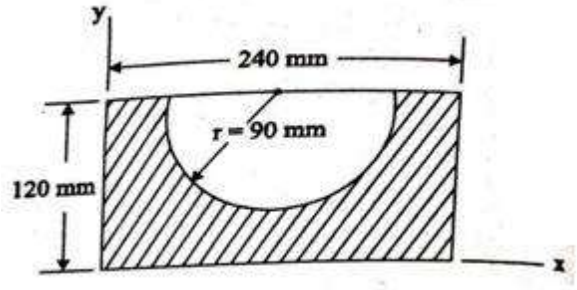
1. A force of 300 N is required just to move a block up a plane inclined at 20° to the horizontal, the force being applied parallel to the plane of Figure-6. If the inclination of the plane is increased to 25°, the force required just to move the block up is 340 N, (the force is acting parallel to the plane). Determine the weight of the block and the coefficient of friction.



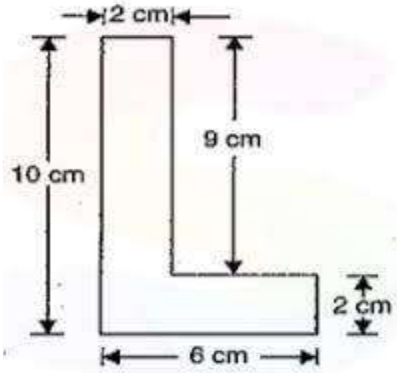
2. A 8m long ladder rests against a vertical wall making an angle of 50° with the wall and resting on a floor, If a boy, whose weight is one half that of the ladder climbs it, at what distance along the ladder will he be, when the ladder is about to slip? The coefficient of friction between the ladder and the wall is 1/3 and that between the ladder and the floor is 1/2.

COURSE OUTCOME 5:

1. Determine the Moment of Inertia of the shaded area as shown in Figure-4 with respect to the x-axis.



2. Find the principal moment of inertia of the plane area about its centroidal axis.



21ME1513	COMPUTER AIDED ENGINEERING GRAPHICS	L	T	P	C
		3	0	2	4

Prerequisites for the course

NIL

Preamble

Engineering drawing is an important tool for all Engineers and for many others professionals. It is the language of Engineers. Engineering Drawing communicates all needed information from the engineer who designed a part to the workers who will manufacture it.

Objectives

1. To understand the importance of the drawing in engineering applications
2. To improve their visualization skills so that they can apply these skill in developing new products
3. To expose them to existing standards related to technical drawings
4. To develop graphic skills for communication of concepts, ideas and design of engineering products
5. Train to practice engineering graphics through drafting software.

CONCEPTS AND CONVENTION**(not for examination)**

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

UNIT I	PROJECTION OF POINTS AND LINES	9

General Principles of orthographic projection – First Angle Projection, projection of points in four quadrants – Projection of straight lines locatedin the first quadrant – inclined to both planes

UNIT II	PROJECTION OF SOLIDS	10

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT III	SECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES	10

Sections of regular solids as per BIS conventions - Constructing sectional views of simple objects and components - Development of lateral surfaces of regular solids-Projection of truncated solids .

UNIT IV	ISOMETRIC PROJECTIONS	8

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

UNIT V	PERSPECTIVE PROJECTIONS	8

Perspective projection of prisms, pyramids and cylinders by visual ray method.

S.No	List of Experiments	CO

1.	Introduction to drafting commands in AutoCAD. Creation of simple geometry and editing practice.	CO1, CO 6
2.	Projection of simple Geometric objects and engineering components using AutoCAD	CO2, CO6
3.	Construction of simple objects and components sectional viewsusing AutoCAD	CO3, CO.6
4.	Isometric projection of simple components-flange, cylinder, chimney, lamp shades, valve, Bracketsusing AutoCAD	CO4, CO6
5.	Creating a Perspective Projection of solids using AutoCAD	CO5, CO6
	Total Periods	**45 Theory + 15 Lab Hours**

Laboratory Requirements

SYSTEM REQUIREMENTS

(For a batch of 30 Students)

Hardware:

1. Intel i3 core due processor with 4GB ram with 500GB hard disk – 30 Nos.
2. Laser Printer – 1 No.

Software:

Drafting package – AutoCAD – Adequate license (Open source)

Suggestive Assessment Methods

CAT 1 (30Marks)	**Model Lab (20 Marks)**	**End Semester Exams (50 Marks)**
30	**20**	**50**

Outcomes

Upon completion of the course, the students will be able to:

CO1: Apply the principles of first angle projection in construction of points and lines.
CO2: Apply the principles of change of position method in projection of simple solids.
CO3: Develop projections of sectioned solids and their developmental surface.
CO4: Develop isometric views from orthographic projections
CO5: Construct the perspective projections of simple solids
CO6: Develop orthographic ,isometric and perspective projection and development of surfaces using drafting software.

Text Books

1. Venugopal K. and Prabhu Raja V., "Engineering drawing + Autocad", New Age International (P) Limited (2022)
2.Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai(2015)

Reference Books

1. Kumar M.S., "Engineering Graphics", D.D. Publications, (2015)
2. Parthasarathy N.S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, (2015)
3. Shah M.B. and Rana B.C., "Engineering Drawing", Pearson Education (2009)
4. N.D.Bhatt, "Engineering Graphics", Charotor Publishing House, 53RD Edition 2019

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 and 1) – 2001: Technical products Documentation – Lettering
3. IS 10714 (Part 20) – 2001 and SP 46 – 2003: Lines for technical drawings
4. IS 11669 – 1986 and SP 46 – 2003: Dimensioning of Technical Drawings
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

Web Resources

1. http://nptel.ac.in/courses/112103019
2. https://archive.nptel.ac.in/courses/112/105/112105294/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	2									3	2
CO .2	3	1	1	1	1								3	2
CO 3	3	1	1	1	1								3	2
CO 4	2	2	1	1	1								3	1
CO 5	2	2	1	1	1								3	2
CO 6	2	2	2	2	2								3	3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	MODEL	END SEM EXAM
REMEMBER				
UNDERSTAND				

APPLY	15	15	20	50
ANALYZE				
EVALUATE				
CREATE				

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Apply the principles of first angle projection in construction of points and lines. (Apply)

1. Draw the projections of the following points on a common reference line. (Apply)
A,35 mm above HP and 25 mm in front of VP
B,40 mm below HP and 15mm behind VP
C,50 mm above HP and 25 mm behind VP
D,45 mm below HP and 25 mm behind VP
E, 30 mm behind VP and on HP

2. A line CD measuring 80 mm is inclined at an angle of 30° to HP and 45° to VP. The point C is 20 mm above HP and 30 mm in front of VP. Draw the projections of the straight line.(Apply)

COURSE OUTCOME 2: Apply the principles of change of position method in projections of solid problems and draw graphically

1. A pentagonal pyramid of base side 25mm and height 40mm, is resting on the ground on one of its triangular faces. The base edge of that face is inclined 30o to VP. Draw the projections of the solid. (A)

2. A hexagonal prism has side 25mm and height 50mm has a corner of its base on the ground and the long edge containing that corner inclined at 30o to HP and 45o to VP. Draw the projections of the solid. (A)

COURSE OUTCOME 3: Develop projections of sectioned solids and their developmental surface.

1. A cylinder of base diameter 50mm and height 60mm rest on its base on HP. It is cut by a plane perpendicular to VP and inclined at 45^0 to HP. The cutting plane meets the axis at a distance 15mm from its top base. Draw the sectional plan and true shape of the section. (A)
2. A regular hexagonal pyramid side of base 30 mm and height 60 mm is vertically on its base on HP, such that two of its sides of the base are perpendicular to VP. It is cut by a plane inclined at 30° to HP and perpendicular to VP. The cutting plane bisects the axis of the pyramid. Obtain the development of the lateral surface of the truncated pyramid. (A)

COURSE OUTCOME 4: Develop isometric views from orthographic projections

1. A cone of diameter 50 mm and axis 70 mm rests on its base on HP. A section plane perpendicular to VP and inclined at 30° to HP cuts the solid and passes through a point on axis which is 40 mm above HP. Draw the isometric view of a truncated cone. (A)

2. A pentagonal pyramid of base edge 25 mm and height 65 mm rests vertically on its base on the HP such that one of its base edge parallel to VP. It is cut by a plane, parallel to HP and perpendicular to VP and passes through a point 25 mm from the apex. Draw the isometric view of the frustum of pyramid. (A)

COURSE OUTCOME 5: Construct the perspective projections of simple solids

1. Draw the perspective view of a square prism of base side 40mm and height 50mm. one vertical lateral face is parallel to PP and 30mm away from it. The station point is 80mm from PP, 80mm above the base and 60mm to the right of the axis of the prism. (APPLY)

2.A hexagonal pyramid of base side 25mm and axis length 50mm is resting on GP on its base with a side of base is parallel to and 20mm behind PP. The station point is 60mm above GP and 80mm in front of PP and lies in a central plane which is 50mm to the left of the axis of the pyramid. Draw theperspective view of a pyramid. (APPLY)

COURSE OUTCOME 6: Students will be able to Develop Orthographic ,isometric and perspective projection and Development of surfaces using drafting software

1. A hexagonal pyramid of base side 30 mm axis length 60 mm is resting on HP on one of its base corners with its axis inclined at 35˚ to HP and parallel to VP. Draw its projections. (APPLY)
2. A cylinder of base diameter 50mm and axis length 50mm is placed horizontally on GP on its base. The axis of the cylinder is 35mm behind PP. The station point is 70mm in front of PP and 70mm above the GP and is 50mm to the left of the axis. Draw the perspective projection of the cylinder. (APPLY)

21CS2512	Python Programming (Common for Mechanical and Civil)	L	T	P	C
		2	0	2	3

Preamble

This course is an introduction to the Python programming language for students without prior programming experience. Students are introduced to core programming concepts like data structures, conditionals, loops, variables, and functions. This course includes an overview of the various tools available for writing and running Python, and gets students coding quickly. It is easy for beginners to learn, it is widely used in many scientific areas for data exploration.

Prerequisites for the course

- Problem Solving Techniques, Logical Thinking

Objectives

1. To know the features of Python.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and use function calls.
4. To make students to apply Python data structures – strings, lists, tuples, dictionaries.
5. To work with files in Python.
6. To handle exceptions.
7. To analyse and explore data using python libraries.

UNIT I	INTRODUCTION TO PYTHON	5

Features of Python - Modes of Python - values and data types: Variables - expressions - statements – Operators - Input and Output – comments.

UNIT II	CONTROL FLOW, FUNCTIONS	5

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Functions: function definition and use, parameters and arguments, recursion.

UNIT III	STRING, LIST, TUPLES	8

Strings: string slices, string functions and methods. Compound data - Lists: list operations - list slices - list methods - list loop. Tuples: tuple assignment - tuple as return value

UNIT IV	DICTIONARY, FILES AND EXCEPTION HANDLING	7

Dictionaries: operations and methods Files and exception: text files, reading and writing files, Command line argument, Errors: SyntaxErrors, Runtime errors, Logical Errors – Exceptions – handling exceptions

UNIT V	MODULES AND PACKAGES	5

Modules, packages, Numpy, Seaborn, Pandas

	Total Periods	**30 Theory +30 Lab**
S.No	**List of Experiments**	**CO**
1	Python Program using conditional statements a) Write a program for checking the given number is even or odd. b) Write a program for finding biggest number among 3 numbers c) Implement python script to read person's age from keyboard and display whether he is eligible for voting or not. d) Implement python script to check the given year is leap year or not.	CO1
2	Python Program using looping statements a) Write a Python Program to generate first N natural numbers. b) Write a python program to read a integer and for all non-negative integers i<n , print i^2. c) Write a Python Program to print factorial of a number. d) Write a Python Program to print sum of digits of a number e) Python Program to Print All Numbers in a Range Divisible by a Given Number f) Python Program to Find Numbers which are Divisible by 7 and Multiple of 5 in a Given Range	CO2
3	Python Programs using functions a) Write a Python Program to Find Fibonacci Numbers using Recursion b) Write a Python Program to generate Electricity Bill.	CO2
4	Python Programs using string	CO3
	a) Write a Python Program to calculate the number of digits and letters in a string. b) Write a Python Program to Count Number of Lowercase Characters in a String c) Write a Python Program to Check if the Substring is Present in the Given String	
5	Python Programs using list a) Python Program to Print Largest Even and Largest Odd Number in a List b) Python Program to Remove Duplicates from a List.	CO3

6	Python Programs using tuples a) Write a Python Program to Create a List of Tuples with the First Element as the Number and Second Element as the Square of the Number	CO3
	Python Programs using dictionaries a) Write a Python Program to Find the Sum of All the Items in a Dictionary b) Write a Python Program to Multiply All the Items in a Dictionary	CO4
5	Python Programs using files a) Write a Python Program to Count the Number of Lines, words, characters a in Text File b) Python Program to Copy One File to Another File.	CO4
7	Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity)	CO4
8	Programs using Python library – NumPy, Pandas, Seaborn a) Write a NumPy program to create an element-wise comparison (greater, greater_equal, less and less_equal) of two given arrays. b) Write a NumPy program to multiply the values of two given vectors. c) Write a Pandas program to get the powers of an array values element-wise. d) Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.	CO5
	e) Write a Python program to find the correlation between variables of iris data. Also create a hitmap using Seaborn to present their relations.	

Laboratory Requirements

- 60 Systems with windows / LINUX operating system with python IDLE or equivalent.

Continuous Assessment Test (30 Marks)	**Lab Components Assessments (20 Marks)**	**End Semester Practical Exams (50 Marks)**
1. Descriptive questions	1. Lab experiments 2. Model examination	1. Descriptive questions

Outcomes

Upon completion of the course, the students will be able to:

CO1: Write Python programs for solving problems using conditional statements.

CO2: Write Python programs for solving problems using looping statement and list and decompose a Python program into functions.

CO3: Represent data using Python strings, lists, and tuples, and solve computational problems using them.

CO4: Solve computational problems using data represented in dictionaries and files handle exceptions while dealing with data.

CO5: Write modules and packages and Use Numpy, Seaborn and Pandas libraries in real time to solve scientific problems.

Text Books

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff/O'Reilly Publishers, 2016.

Reference Books

1. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, 2016.

Web Resources

1. Python for Data science - https://onlinecourses.nptel.ac.in/noc20_cs36/course (Unit V – Numpy, Pandas, Seaborn)

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
1	2	2	2	1	1									
2	1	1	1	2	1									
3	2	2	1	1	1									
4	2	1	1	2	1									
5	1	1	1	2	1									

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	Lab Experiments	Model Lab	END SEM PRACTICAL EXAM

Remember	10	10			10
Understand	10	10			10
Apply	80	80	100	100	80
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT

QUESTIONSCOURSE OUTCOME

1. Write a Python Program to read the unit of electricity consumed in a house and calculate the amount to be paid for the electricity consumed. The bill amount should be calculated as per the given specification:
   a. For 0 to 100 units the per unit is 0/-
   b. For 0 to 200 units, for the first 100 unit the per unit cost is zero and the next
      100 units, the consumer shall pay 1.5 per unit.
   c. For 0 to 500 units, the consumer shall pay 0 for the first 100 units, for the next 100 units the consumer shall pay 2 per unit, for the next 300 units the unit cost is 3.00/- (Apply)
2. Explain in detail about the various conditional statements that are supported by Python. (Understand)
3. Differentiate variables and constants. (Analyse)

COURSE OUTCOME 2:

1. Write a Python Program to Read a Number n and Compute n+nn+nnn. (Apply)
2. Differentiate break and continue. (Analyse)
3. Write a Python Program to read the unit of electricity consumed in a house and calculate the amount to be paid for the electricity consumed. The bill amount shouldbe calculated as per the given specification:
   a. For 0 to 100 units the per unit is 0/-
   b. For 0 to 200 units, for the first 100 unit the per unit cost is zero and the next
      100 units, the consumer shall pay 1.5 per unit.
   c. For 0 to 500 units, the consumer shall pay 0 for the first 100 units, for the next 100 units the consumer shall pay 2 per unit, for the next 300 units the unit cost is 3.00/- (Apply)

COURSE OUTCOME 3:

1. What is printed by the following statements? (Appy)

```
s = "engineering"
r = ""
for item in s:
r =item.upper()=r

print(r)
```

2. Is string mutable. Justify your answer. (Understand)
3. List out some compound data type that are supported by python.(Remember)

COURSE OUTCOME 4:

1.What happens if the file is not found in the following Python code? (Apply)

```
a=False
while not a:
try:
    f_n = input("Enter
    file name")i_f =
    open(f_n, 'r')
except:
    print("Input file not found")
```

3. Write a Python Program that Reads a Text File and Counts the Number of Times aCertain Letter Appears in the Text File. (Apply)
4. How will you handle exception when it is raised? Explain. (Understand)

COURSE OUTCOME 5:

1. Write a Pandas program to create and display a one-dimensional array-like objectcontaining an array of data using Pandas module. (Apply)
2. Explain in detail about modules and packages in Python. (Understand)

SEMESTER III

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS1103	தமிழர் மரபு / Tamil Heritage	HSSM	1	1	0	0	1
2	21MA3201	Probability & Statistical Analysis	BS	4	3	1	0	4
3	21CE3601	Construction material, techniques and practices	PC	3	3	0	0	3
4	21CE3602	Surveying	PC	3	3	0	0	3
5	21CE3603	Engineering Geology	PC	3	3	0	0	3
Theory cum practical								
1	21CE3501	Strength of Materials I	ES	5	3	0	2	4
Practical Courses								
1	21CE3611	Surveying Laboratory	PC	4	0	0	4	2
2	21CE3511	Computer Aided Building Drawing Laboratory	ES	4	0	0	4	2
Employability Enhancement Course								
3	21PT3902	Verbal Ability	EEC	2	0	0	2	1
			Total	**28**	**15**	**1**	**12**	**22**

21HS1103	**TAMIL HERITAGE**	**L**	**T**	**P**	**C**
		1	**0**	**0**	**1**

Preamble: This course is offered to equip students to create awareness of the contribution of Tamil people to Indian culture by highlighting the characteristics of Tamil language and literature and exhibiting Tamil culture through traditional arts such as performing arts and fine arts.

Prerequisites for the course:

The prerequisite knowledge required to study this course is basic knowledge in English and Tamil Heritage.

UNIT I	**LANGUAGE AND LITERATURE**	**6**

Language Families in India-Dravidian Languages –Tamil as Classical Language –Classical Literature in Tamil – Secular Nature of Sangam Literature –Distributive Justice in Sangam Literature Management Principles in Thirukural - Tamil Land Bakthi Literature Azhwars and Nayanmars-Forms of minor Poetry development of Modern literature in Tamil-Contribution of

Bharathiyar and Bharathidhasan.		
UNIT II	**HERITAGE-ROCK ART PAINTINGS TO MODERN ART–SCULPTURE**	**6**
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making- Massive Terracotta sculptures, Village Deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.		
UNIT III	**FOLK AND MARTIAL ARTS**	**6**
Therukoothu, Karakattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance-Sports and Games of Tamils.		
UNIT IV	**THINAI CONCEPT OF TAMILS**	**6**
Flora and Fauna of Tamils & Agam and Puram Concept from Tholkappiyam and Sangam Literature -Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age-Export and Import during Sangam Age-Overseas Conquest of Cholas.		
UNIT V	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	**6**
Contribution of Tamils to Indian Freedom Struggle-The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine–Inscriptions & Manuscripts–Print History of Tamil Books.		
Total Periods		**30**

Course Outcomes:

CO1	To widen the knowledge on the characteristics of Tamil language and literature.
CO2	To explore the traditional Tamil fine arts and its techniques of Tamil Heritage.
CO3	To evaluate the various types of performing arts and their cultural context.
CO4	To get an insight on the lifestyle and living techniques of Tamil ancestors.
CO5	To recognise and perceive the role played by Tamils in the unity and development of India.

CO PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
1								1	2	3	1	3
2								1	3	2	3	2
3								1	3	2	1	2
4								3	2	2	3	2
5								2	3	3	2	3

TEXT-CUM-REFERENCE BOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL–(in print)
2. Social Life of the Tamils- The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Keeladi-'Sangam City Civilization on the banks of river Vaigai'(Jointly Published by:Department of Archaeology &TamilNadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Studies in the History of India with Special Reference to TamilNadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization(Jointly Published by:Department of Archaeology &TamilNadu Text Book and Educational Services Corporation,Tamil Nadu)
8. Journey of Civilization Industo Vaigai(R.Balakrishnan)(Published by:RMRL)– Reference Book.

21HS1103	தமிழர் மரபு	L	T	P	C
		2	0	0	1

முன்னுரை(Preamble)

இப்பாடத்திட்டம் பொறியியல் பயிலும் முதலாம் ஆண்டு மாணவர்களின் முதலாம் பருவத்திற்கு உரியது. தமிழ் மொழி மற்றும் இலக்கியத்தின் தன்மைகளை எடுத்துரைத்து மரபுக் கலைகளான நிகழ்த்து கலைகள் மற்றும் நுண்கலைகள் வழியாகத் தமிழ்ப் பண்பாட்ட புலப்படுத்தி இந்திய பண்பாட்டிற்கு தமிழர்கள் ஆற்றிய பங்கினை மாணவர்கள் அறியச் செய்தல்.

பாடநெறிக்கான முன்நிபந்தனைகள்(Prerequisites for the course)

தமிழ் மொழியில் எழுத படிக்க தெரிந்திருத்தல் அவசியம்.

அலகு I	மொழி மற்றும் இலக்கியம்	6

இந்திய மொழிக் குடும்பங்கள்- திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ் காப்பியங்கள் தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - சிற்றிலக்கியங்கள்- தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி- தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II	மரபு- பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை- சிற்பக்கலை	6

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள்- தேர் செய்யும் கலை- சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள்- குமரி முனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள்- மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு..

அலகு III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	6

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்

விளையாட்டுகள்		
அலகு IV	**தமிழர்களின் திணைக் கோட்பாடுகள்**	**6**
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும் , கல்வியும் - சங்க கால நகரங்களும் துறைமுகங்களும் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.		
அலகு V	**இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**	**6**
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ் புத்தகங்களின் அச்சு வரலாறு		
Total Periods		**30**

21MA3201	**PROBABILITY AND STATISTICAL ANALYSIS**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

Preamble:

This course provides an introduction to numerical methods and engineering statistics for engineering students. The focus of numerical methods is translating engineering problems into algorithms and implementing them in a spreadsheet or programming language. Topics covered include numerical interpolation, integration and differential equations. The statistics portion teaches students basic probability theory, standard distribution, the central limit theorem, hypothesis testing, confidence intervals and design of experiments.

Prerequisites for the course

Basic knowledge in probability theory.

Objectives

The Course will enable learners:

1. To improve their ability in solving partial and ordinary differential equations with initial and boundary conditions.
2. To have knowledge in simple integrals.

3. To introduce the basic concepts of probability.
4. To familiarize with ANOVA
5. To apply the concept of testing of hypothesis to Engineering problems

UNIT I	Interpolation and Numerical Integration	9+3

Lagrange's interpolation formula for unequal intervals – Newton's forward and backward difference interpolation for Equal intervals – Numerical single integration using Trapezoidal rule, Simpson's 1/3 rule and Simpson's 3/8 rule

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Newton's forward and backward interpolation, Numerical integration.

UNIT II	Numerical Solution of Ordinary Differential Equations	9+3

Solution of ODE by Single step methods: Taylor's series method - Euler's method - Fourth orders Runge-Kutta method for solving first order equations - Multi step methods: Milne's method for solving first order equations.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Taylor's series, Euler's method, Fourth order Runge-Kutta method and Adam's method

UNIT III	Probability and Distributions	9+3

Definitions of probability, sampling theorems, conditional probability; mean, median, mode and Standard deviation; Random variables, Binomial, Poisson and Normal distribution.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Probability, Random variables and distributions.

UNIT IV	Testing of Hypothesis	9+3

Sampling distributions and Standard Error - Small samples and large samples - Test of hypothesis - Type I, Type II Errors - Large sample tests for mean –Small sample tests for mean – t and f test - Chi-Square distribution -Test of independence of attributes.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on Small sample tests for mean – t ,f test, Chi- Square distribution.

UNIT V	Design of Experiments	9+3

Basic principles of experimentation - Analysis of variance – One-way classification – Completely Randomized Design –Two-way classification - Randomized Block Design – Comparison of CRD and RBD.

SUGGESTED EVALUATION METHODS:

- Tutorial Problems on ANOVA, Completely Randomized Design

Total Periods	**45 + 15 = 60 Periods**

Suggestive Assessment Methods

Continuous Assessment Test	Formative Assessment Test	End Semester Exams

(20 Marks)	(20 Marks)	(60 Marks)
1. Descriptive Questions	1.Assignment 2. Online Quizzes	1. Descriptive Questions

Outcomes

Upon completion of the course, the students will be able to:

CO 1: Apply numerical techniques in interpolations and Integration (Apply)

CO 2: Apply the concepts of probability which can describe real life phenomenon. (Apply)

CO 3: Apply the concept of probability distributions which can describe real life Problems (Apply)

CO 4: Compare testing of hypothesis for small and large samples in real life problems. (Analyze)

CO 5: Analyze the design of experiments in the field of agriculture (Analyze)

Text Books

1. S.R.K.Iyengar & R.K Jain , "Numerical Methods" New Age International Publishers , New Edition 2015.
2. Grewal. B.S. and Grewal. J.S., "Numerical Methods in Engineering and Science ", 10th Edition, Khanna Publishers, New Delhi, 2015.
3. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

Reference Books

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, New Edition, 2017.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 2016.
4. Advanced Engineering Mathematics E. Kreyszig John Wiley & Sons 10th Edition, 2016.
5. Engineering Mathematics Srimanta Pal et al Oxford University Press 3 rd Edition, 2016

Web Resources:

1. Numerical Integration - https://archive.nptel.ac.in/content/storage/111/107/111107105/MP4/mod01lec01.mp4 https://youtu.be/YTHt4Sp8Hag
2. Numerical Solution of Ordinary Differential Equations **- https://archive.nptel.ac.in/content/storage2/127/106/127106019/MP4/mod01lec01.mp4**
3. https://youtu.be/m2p6hrQGaxQ
4. Probability and distributions -
5. https://youtu.be/cp7_ZF2kNi4
6. Testing of hypothesis - https://youtu.be/8oNGkvuRP60
7. Design of experiments - https://youtu.be/KhjM8YI3agk

CO Vs PO Mapping and CO Vs PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	1	1				1	1			1			
2	3	2	1	1				1	1			1			
3	3	2	1	1				1	1			1			
4	3	2	1	1				1	1			1			
5	3	2	1	1				1	1			1			

ASSESSMENT PATTERN:

BLOOM'S CATEGORY	ASSESSMENT TESTS				END SEMESTER EXAMINATION
	CAT – 1	CAT -2	FAT - 1	FAT - 2	
REMEMBER	10	10	5	5	10
UNDERSTAND	30	10	10	10	10
APPLY	60	40	10	10	50
ANALYZE	0	40	0	0	30
EVALUATE	0	0	0	0	0
CREATE	0	0	0	0	0

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1 (CO 1) : (Apply)

1) (i) Find the y(3) in the following table using Lagrange's interpolation formula

X	0	1	2	4
Y	1	3	9	81

ii) By dividing the range into 10 equal parts evaluate $\int_0^{\pi} sinx\ dx$

2) Find $y(0.1)$ using Runge-Kutta (R.K) method given that $\frac{dy}{dx} = y^2 + xy$; y(0)=1

COURSE OUTCOME 2 (CO 2) : (Apply)

1) A random variable 'X' has the following probability function

X	0	1	2	3	4	5	6	7	8

p(x) a 3a 5a 7a 9a 11a 13a 15a 17a

(i) Determine the value of 'a'
(ii) Find $P(X < 3), P(X \geq 3), P(0 < X < 5)$
(iii) Find the distribution function of X.

2) If X is a continuous random variable with probability density function

$$f(x) = \begin{cases} kx^2, & -1 < x < 1 \\ 0, & else\ where \end{cases}$$

then find (i)The value of k

(ii)The mean and variance of X

(iii) $P(\frac{1}{3} \leq x < 4)$

COURSE OUTCOME 3 (CO 3) : (Apply)

1) Derive Mean and Variance of a Binomial distribution
2) The weekly wages of 1000 workmen are normally distributed around a mean of Rs. 70 with Standard Deviation of Rs. 5. Estimate the number of workers whose weekly wages will be (i) Between Rs. 69 and 72 (ii) less that Rs. 69 (iii) more than Rs 72.

COURSE OUTCOME 4 (CO 4) : (Analyze)

1. A random sample of 10 boys had the following I.Q.'s 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q of 100 ? Find a reasonable range in which most of the mean I.Q values of samples of 10 boys lie.

2. To verify whether a course in accounting improved performance, a similar test was given to participant both before and after the course. The marks are

Before :	44	40	61	52	32	44	70	41	67	72	53	72
After :	53	38	69	57	46	39	73	48	73	74	60	78

What the course useful?

3. Two batches each of 12 animals are taken for test of inoculation. One batch was inoculated and the other batch was not inoculated. The numbers of dead and surving animals are given in the following table in the both cases. Can the inoculation be regarded as effective against the disease?

	Dead	Survived
Inoculated	15	85
Not inoculated	25	75

COURSE OUTCOME 5 (CO 5): (Analyze)

1. An experiment was designed to study the performance of 4 different detergents for cleaning fuel injectors. The following "cleanness "readings were obtained with specially designed equipment for 12 tanks of gas distributed over 3 different models of engines:

	Engine 1	Engine 2	Engine 3	Total

Detergent A	45	43	51	139
Detergent B	47	46	52	145
Detergent C	48	50	55	153
Detergent D	42	37	49	128
Total	182	176	207	565

Perform the ANOVA and test at 0.01 level of significance whether there are differences in the detergents or in the engines.

2. A variable trial was conducted on wheat with 4 varieties in a Latin Square Design . The plan of the experiment and the per plot yield are given below.:

C	25	B	23	A	20	D	20
A	19	D	19	C	21	B	18
B	19	A	14	D	17	C	20
D	17	C	20	B	21	A	15

Analyze data and interpret the result.

21CE3601	CONSTRUCTION MATERIALS, TECHNIQUES AND PRACTICES	L	T	P	C
		3	0	0	3

Prerequisites for the course

- **NIL**

Objectives

1. To give complete exposure on stones, bricks and their suitability.
2. To get idea on weather proofing materials, timber, applications of ferrous and non-ferrous materials.
3. To study the various construction practices prevailing in the field.
4. To know the different techniques practiced in construction.
5. To explore the suitability of equipment employed in different ground conditions.

UNIT I	BASIC CONSTRUCTION MATERIALS	9

Stones: Classification - Properties and Tests - Artificial Stones. **Bricks**: Brick Earth - Composition and Harmful Constituents - Manufacturing Process, Classification - Properties - Sampling and Testing - Brick Substitutes - Tiles. **Timber**: Market Forms - Physical Properties, Seasoning, Defects and Preservative Treatment. **Ferrous Metals**: Iron And Steel - Market Forms - Structural Steel - Composition - Materials Properties and Behaviour. **Lime** – Preparation of lime mortar

UNIT II	CONSTRUCTION TECHNIQUES	9

Structural Systems - Load Bearing Structure - Framed Structure - Load Transfer Mechanism – Floor System - High Rise Building Technology - Environmental Impact of Materials – Responsible Sourcing Material Used - Construction Methods - Natural Buildings - Passive Buildings - Intelligent(Smart) Buildings - Meaning - Building Automation - Energy Efficient Buildings for Various Zones-Case Studies of Residential, Office Buildings and Other Buildings in Each Zones.

UNIT III	CONSTRUCTION PRACTICES	9

Specifications - Construction Co-ordination - Site Clearance And Marking - Earthwork - Foundations and Basements - Mortar - Types - Masonry - Brick Masonry - Bonds - Stone Masonry – Classification. Flooring – Damp Proof Courses – Construction Joints – Movement and Expansion Joints - Centering and Shuttering – Scaffoldings – Weather and Water Proof – Roof Finishes – Acoustic and Fire Protection.

UNIT IV	SUB AND SUPER STRUCTURE CONSTRUCTION	9

Techniques of box jacking- pipe jacking- under water construction of diaphragm walls and basement Tunnelling techniques- piling techniques -well and caisson - sinking cofferdam - sheet pile- Shoring for deep cutting.

Launching girders, bridge decks, off shore platforms - special forms for shells - techniques for heavy decks, Material handling - erecting light weight components on tall structures.Shoring and underpinning.

UNIT V	CONSTRUCTION EQUIPMENT	9

Selection of Equipment - Earthwork Equipment – Tractors, Motor Graders, Scrapers, Front End Waders, and Earth Movers - Equipment For Soil Compaction - Equipment For Compaction, Batching And Mixing and Concreting - Material Handling and Hoisting - Dewatering and Pumping - Trenching, Tunnelling and Dredging.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Select suitable construction materials.
CO2: Understand various techniques in construction.
CO3: Understand various construction practices available in masonry and support structures.
CO4: Execute construction Practices effectively in the field.
CO5: Employ appropriate equipment towards speedy completion of projects.

Text Books

1. Rajput.R.K.,"Engineering Materials", S. Chand and Company Ltd., 2008.
2. Duggal.S.K.,"Building Materials",4thEdition, NewAge International , 2008.
3. Varghese, P.C. "Building construction", Prentice Hall of India Pvt.Ltd, New Delhi, 2016.
4. Peurifoy, Schexnayder, Shapira, “Construction Planning, Equipment and Methods”, Tata McGraw Hill Education Private Ltd-9th edition, 2018.
5. Arora S.P. and Bindra S.P., “The Text Book of Building Construction”, DhanpatRai and Sons, 2010.

Reference Books

1. Jagadish.K.S,"Alternative Building Materials Technology", NewAge International, 2007.
2. Gambhir. M.L., &NehaJamwal., "Building Materials, products, properties and systems",Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.
3. National Building Code of India, Part V, "Building Materials”, 2016.Sharma S.C.Construction Equipment and Management,Khanna Publishers New Delhi, 2002

Web Resources

1. https://nptel.ac.in/courses/105102088/
3. https://nptel.ac.in/courses/105103093/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1				1	1					1		
2	1					1	1					1		
3	2	1			2	2	2					1		
4	2	1			2	2	1					2		
5	2	2			2	2	1					1		
6	2	2			2	2	1					1		

21CE3602	SURVEYING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Engineering Mathematics

Objectives

1. Students will be introduced to the principles of various basic surveying methods for linear and angular measurements for determination of distances, elevations, areas and volumes.
2. They will be exposed to the recent advances in surveying methods for application in Civil Engineering Projects.

UNIT I	INTRODUCTION TO CHAIN AND COMPASS SURVEYING	9

Definition - Principles - Classification - Field work and office work - Types of chain - methods of ranging a line - chain survey of an area, uses of cross staff - sources and limits of error and their correction. Magnetic and true north, magnetic declination and its variation - Bearings - Prismatic compass - Surveyor's compass - compass survey - local attraction and its elimination – Traversing.

UNIT II	LEVELLING AND CONTOURING	9

LEVELLING: Principles and theory of levelling - Datum, bench mark and reduced level - level surface and horizontal plane - mean sea level - Types of levels, levelling staff and their types - effect of curvature and refraction - Balancing back sight and foresight distance - Longitudinal, cross-sectional and reciprocal levelling - Reducing levels by rise and fall and height of collimation methods and check- **CONTOURING**: Definition - Contour interval and horizontal equivalent - characteristics - interpolation - Drawing contour lines - uses of contour maps. Area and volume calculation.

UNIT III	THEODOLITE AND TACHEOMETRIC SURVEYING	9

THEODOLITE SURVEYING: Theodolite - types, features and fundamental axes - adjustments; temporary and permanent - methods of measurement of horizontal angles – taking vertical angles - Heights and distances of inaccessible points - methods of traversing **TACHEOMETRIC SURVEYING**: Methods - Determination of constants of the tacheometer - use of analectic lens - distance and elevation formulae for inclined sights with vertical and normal holding staff - movable hair method - principles of tangential tacheometry - problems in tacheometry - subtense bar method.

UNIT IV	CURVES AND & HYDROGRAPHIC SURVEY	9

CURVES: Elements of simple curve, compound curve, Reverse curve, Transition curve and Vertical curves - Methods of setting out of simple curve. **HYDROGRAPHIC SURVEY:** Introduction to hydrographic surveying- Tides-MSL- Sounding methods- Three-point problem.

UNIT V	ADVANCED SURVEYING METHODS	9

Principle of Electronic Distance Measurement, Modulation, and Types of EDM instruments, Total Station - Parts of a Total Station - Accessories - Advantages and Applications, Field Procedure for total station survey, Care and maintenance of Total Station instruments. GPS SURVEYING: Basic concepts - Different segments- space, control and user segments-satellite configuration- signal structure- orbit determination and representation -Task of control segment. Remote sensing.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Descriptive written exam	MCQ	Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1 :	Identify the various surveying instruments required for finding coordinates and mapping
CO2 :	Level the topography and prepare contour maps for different terrain conditions.
CO3 :	Compute distance, elevation, area and volume of a location using telescopic instruments.
CO4 :	Set out curves and measure boundaries of water bodies.
CO5 :	Illustrate geospatial maps using advanced surveying instruments.

Text Books

1. Dr. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain, Surveying (Volume –I and II), Lakshmi Publications, 17th Edition, 2016

2. Duggal S K., Surveying, Vol-I and II, MCGraw Hill Education(India) Private Limited, 4th Edition, 2013.

Reference Books

1. Basak N N, Surveying& Levelling, Tata McGraw-Hill Education,2nd Edition, 2014

2. Madhu, N, Sathiskumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2nd Edition, 2017.

3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2nd Edition, 2016.

4. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 4th Edition, 2012.

5. Seeber G, Satellite Geodesy , water De Gruyter, Berlin 1998.

Web Resources
1. https://nptel.ac.in/courses/105104100/ 2. http://gen.lib.rus.ec/book/index.php?md5=1820B42F5CEB91750B86FB5159F34048

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1			3	3	1			1			1	2	
2	1	3	1	2	2	1			1			1	2	
3	1	3	1	2	2	1			1			1	2	
4	1	2	1	2	3	1			1			1	2	
5	1			2	3	1			1			1	2	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	30	30	20	20	20
Understand	30	20	30	20	20
Apply	40	50	50	60	60
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Enumerate the factors to be considered for choosing chain survey.
2. State the different methods of surveying with prismatic compass

COURSE OUTCOME 2:

1. The following consecutive readings were taken with a level and 5m leveling staff on continuously sloping ground at a common interval of 20m. 0.385; 1.030; 1.925; 2.825; 3.730; 4.685; 0.625; 2.005; 3.110; 4.485. The RL of the first point was 200m. Calculate the RL of the points by rise and fall as well as height of collimation method. Also find the gradient between first and last point.
2. The following staff readings were observed successively with level, the instrument having been moved forward after the 2nd, 4th and 8th readings. 0.875; 1.235; 2.310; 1.385; 2.930; 3.125; 4.125; 0.120; 1.875; 2.030; 3.765. The RL of the first point was 150m. Calculate the RL of the points by rise and fall as well as height of collimation method. If the distance between the first and last point was 1500m, find its gradient.

COURSE OUTCOME 3:

1. A tacheometer was set up at a station A and the following readings were obtained on a vertically held staff. The constants of the instruments were 100 and 0.1. Find the horizontal distance from A to B and the reduced level of B.

Station	Staff station	Target reading	Vertical angle	Remarks
A	B	3.500	+ 4°20’	RL of BM = 150.000m and height of instrument at A=1.500m
	B	0.500	- 2° 20’	

2. Draw a neat diagram of transit theodolite and describe its essential parts.

COURSE OUTCOME 4:

1. Enumerate in detail about the sounding methods in hydrograpic surveying.

2. A series of offsets were taken from a chain line to a curved boundary at intervals of 5m in the following order: 1.75, 2.50, 4.75, 5.85, 3.95, 4.90, 6.55 and 5.25m. Calculate the area enclosed between the survey line, irregular boundary and the first and last offsets, using the Trapezoidal and Simpson’s rule.

COURSE OUTCOME 5:

1. State the significance of Total station in the modern methods of surveying
2. Discuss the application of GPS in surveying.

21CE3603	ENGINEERING GEOLOGY	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Engineering Chemistry

Objectives

1. To understand the importance of geological structure and minerals available in earth crust.
2. To impart knowledge in choosing the type of foundation for civil engineering structures.

UNIT I	PHYSICAL GEOLOGY	9

Geology in civil engineering–branches of geology–structure of earth and its composition–weathering of rocks–scale of weathering–soils-landforms and processes associated with river, wind, groundwater and sea–relevance to civil engineering. Plate tectonics.

UNIT II	MINEROLOGY	9

Physical properties of minerals–Quartz group, Feldspar group, Pyroxene- hypersthene and augite, Amphibole – hornblende, Mica – muscovite and biotite, Calcite, Gypsum and Clay minerals.

UNIT III	PETROLOGY	9

Classification of rocks- distinction between Igneous, Sedimentary and Metamorphic rocks- Engineering properties of rocks - Description, occurrence, engineering properties - distribution and uses of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble.

UNIT IV	STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS	9

Geological maps–attitude of beds, study of structures–folds, faults and joints–relevance to civil engineering. Geophysical methods – Seismic and electrical methods for subsurface investigations.

UNIT V	GEOLOGICAL CONSIDERATIONS FOR CIVIL ENGINEERING STRUCTURES AND GEOHAZARDS	9

Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels and Road cuttings. Coastal protection. Earthquake – Seismic zones of India, Landslides – causes and mitigation. Tsunami – causes and mitigation. Case studies from India, Remote sensing for civil engineering applications - Satellite Image interpretation.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Descriptive written exam	MCQ	Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1 :	Illustrate the structures of earth and the process involved in earth crust creation.
CO2 :	Interpret the engineering properties of minerals in construction materials.
CO3 :	Distinguish the engineering properties of rocks in construction.
CO4 :	Identify the subsurface geological structures using geo-physical methods.
CO5 :	Illustrate the design considerations of geological structure and geo hazard mitigation

Text Books

1.Varghese,P.C., Engineering Geology for Civil Engineering Prentice Hall of India Learning Private Limited, New Delhi, 2012.

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. ChennaKesavuluN."Textbook of Engineering Geology", Macmillan India Ltd., 2009.

5. Parbin Singh. A "Text book of Engineering and General Geology", Katson publishing house, Ludhiana 2009.

Reference Books

1. Muthiayya,V.D. “A Text of Geology”, Oxford IBH Publications, Calcutta, 1969

2. BlythF.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London,2010.

3. Bell.F.G.."Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.

4. Dobrin,M.B"An introduction to geophysical prospecting",McGrawHill,NewDelhi,1988.

Web Resources

1.https://nptel.ac.in/courses/105105106/

2. http://gen.lib.rus.ec/book/index.php?md5=3064763E96667E9AA8B489C03E8383FA

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2			3		1	1					1	1	
2	3			1		1	1					1	1	
3	3			1		1	1					1	1	

4	2			3	2	1	1					1	1	
5	2			3	2	1	1					1	1	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	30	30	30	30	30
Understand	50	50	50	50	50
Apply	20	20	20	20	20
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Conclude topographical formation of the earth.
2. Describe chemical weathering and its impact on civil works.

COURSE OUTCOME 2:

1. Discuss in detail the physical properties of feldspar group of minerals.
2. Discuss in detail the physical and chemical properties of Hypersthene and Augite.

COURSE OUTCOME 3:

1. Explain characteristics of sedimentary rocks in origin.
2. Summarise physical properties of rocks.

COURSE OUTCOME 4:

1. Classify faults with neat sketches.
2. Appraise types of joints and its impact on civil project.
3. Explain the different methods of geological investigation.

COURSE OUTCOME 5:

1. Describe site suitability for construction of dams.
2. List the types of coastal protection structures
3. Summarise site suitability for road formation.

21CE3501	STRENGTH OF MATERIALS I	L	T	P	C
		3	0	2	4

Prerequisites for the course

- Mechanics for civil engineering

Objectives

1. To learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders.
2. To learn the load transfer mechanism in beams and its deformations.
3. To impart knowledge on the effect of torsion and two dimensional state of stress.

UNIT I	STRESS AND STRAIN	9

Stress and strain at a point – Tension, Compression, Shear Stress. Hooke's Law – Elastic constants - Relationship between elastic constants – Stress Strain Diagram for Mild Steel, TOR steel, Concrete - Ultimate Stress - Yield Stress – Factor of Safety- Composite Bars - Thermal Stresses.

UNIT II	SHEAR AND BENDING IN BEAMS	9

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

UNIT III	DEFLECTION OF BEAMS	9

Introduction-Double integration method - Macaulay's method - Area moment method - conjugates beam method for computation of slope and deflection of determinant beams.

UNIT IV	TORSION AND SPRINGS	9

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 - Closed and Open Coiled helical springs - springs in series and parallel.

UNIT V	COMPLEX STRESSES AND PLANE TRUSSES	9

2 D State of Stress – 2 D Normal and Shear Stresses on any plane – Principal Stresses and Principal Planes. – Plane trusses: Analysis of plane trusses – method of joints – method of sections.

S.No	List of Experiments	CO
1	Tension test on mild steel rod.	CO1
2	Compression test on wood.	CO4
3	Study of Torsion test on mild steel rod.	CO4
4	Impact test on metal specimens	CO5
5	Hardness test on metals	CO5
6	Deflection test on metal beams	CO3 , CO2
7	Compression test on Helical Spring	CO4

Total Periods	**45 Theory +15 Lab**

Laboratory Requirements for a batch of 60 Students

1. UTM of minimum 400 kN capacity
2. Hardness testing machine
3. Beam deflection test apparatus
4. Impact testing machine
5. Spring Testing Machine

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Lab Components Assessments (20 Marks)**	**End Semester Exams (50 Marks)**
1. Written Examination	1. Completion of Suggested Exercises	1. Written Examination

Course Outcomes

Upon completion of the course, the students will be able to:

CO1	Summarize the fundamental concepts of stress and strain in mechanics of solids and structures.
CO2	Evaluate theshear force and bending moment in beams and understand concept of theory of simple bending.
CO3	Calculate the deflection of beams for different loading conditions.
CO4	Evaluate the stresses and deformation in shafts and springs.
CO5	Analyze the plane trusses and Understand the concepts of stress and strain, principal stresses and principal planes

Text Books

1. Rajput.R.K. “Strength of Materials”, S.Chand and Co, New Delhi, 2007.
2. Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010.
3. Bansal R.K. "Strength of Materials”, laxmi publications Pvt., Ltd., New Delhi 2010.

Reference Books

1. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.
2. Timoshenko.S.B. andGere.J.M, “Mechanics of Materials”, Van NosReinbhold, New Delhi 1995.
3. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS I Strength of materials, Laxmi publications. New Delhi, 2015.
4. Vazirani.V.N and Ratwani.M.M, “Analysis of Structures”, Vol I Khanna Publishers, New Delhi, 1995.
5. Junnarkar.S.B. and Shah.H.J, “Mechanics of Structures”, Vol I, Charotar Publishing House, New Delhi, 1997
6. Ugural. A.C., "Mechanics of Materials", Wiley India Pvt. Ltd., New Delhi, 2013.

Web Resources

1. https://nptel.ac.in/courses/105105108/
2. http://gen.lib.rus.ec/book/index.php?md5=559740B18A447796210A8D375C9501DF

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	1	1								1	2	
2	2	3	1	1								1	2	
3	2	3	1	1								1	2	
4	2	3	1	1								1	2	
5	2	3	1	1								1	2	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT – 1	CAT -2	Lab Components	Model Exam	END SEMESTER EXAMINATION
Remember	10	10		10	10
Understand	10	10	10	30	10
Apply	80	80	10	60	80
Analyze					
Evaluate					
Create					

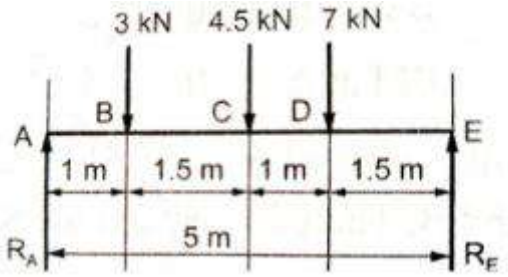
COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

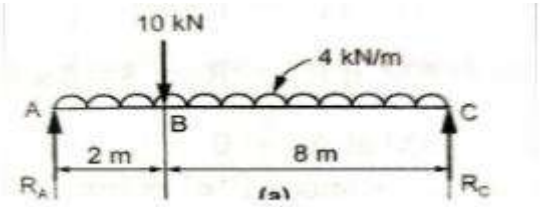
1. Determine the change in length, breadth, and thickness of a steel bar which is 5m long,20mm wide and 15 mm thick subjected to an axial pull of 100kN in the direction of its length takeE = 200 Gpa and poission's ratio 0.3List the advantages of limit state method over other methods..
2. A bar of 20 mm diameter is tested in tension. It is observed that when a load of 40 kN isapplied, in the extension measured over a gauge length of 200 mm is 0.12 mm and contractiondiameter is 0.0036mm. Find poisson's ratio and elastic constants E, G and K.

COURSE OUTCOME 2:

1. Analyse the beam as shown in fig and draw the SFD and BMD



2. Analyse the beam as shown in fig and draw the SFD and BMD



COURSE OUTCOME 3:

1. A cantilever of length 4 m carries a UDL of 8 kN/m length over the entire length. If the section is rectangular of 150 mm x 260 mm, find the deflection and Slope at the free end.Take E = 2.1 x 10 5 N/mm^2
2. A Simply supported beam with a span of 8 m carries a point 5 kN at 6 m from the leftsupport. If for the section, I = 78 x 10 ^{6} mm ^{4} and E = 2.1 x 10 ^{5} N/mm ^{2}. Calculate the Slopeand Deflection at each point by Double integration method.

COURSE OUTCOME 4:

1. A solid steel shaft has to transmit 75kW at 200 r.p.m. Taking allowable shear stress as 70 N/mm2.Find suitable diameter for the shaft, if the maximumtorque transmitted at each revolution exceeds the mean by 30%.
2. A closely coiled helical spring of round steel wire 10mm in diameter having10 complete turns with a mean diameter of 12cm is subjected to an axialload of 200 N. Determine:

   (i)The deflection of the spring.

   (ii)Maximum shear stress in the wire,

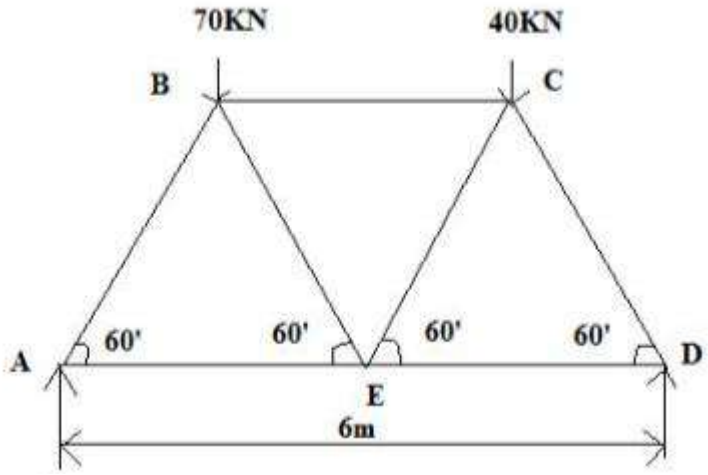
   (iii)Stiffness of the spring.

   Take C=8x10 ^{4} N/mm ^{2}

COURSE OUTCOME 5:

1. The principal stresses at a point across two mutually perpendicular planes are 75MN/m 2 (Tensile) and 35MN/m 2 (Tensile).Find the normal, shear and resultant stress and its obliquity on a plane at 20^0 with the major principle stress. Find the forces in the members using method of joints

2. Determine the forces in all the members of the Truss shown in fig. By using Method of Joint.



21CE3611	SURVEYING LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- Surveying

Objectives

1. To familiarize with the various surveying instruments and methods.

S.No	List of Experiments	CO
1	Study of chains and its accessories	**CO 1**
2	Compass Traversing	**CO 1**
3	Fly levelling	**CO 2**
4	Check levelling	**CO 2**
5	Longitudinal and Cross sectional levelling	**CO 2**
6	Measurement of horizontal angles and vertical angles using theodolite	**CO 3**
7	Determination of Tacheometric Constants	**CO 3**
8	Heights and distances by stadia Tacheometry	**CO 3**
9	Heights and distances by Tangential Tacheometry	**CO 3**
10	Heights and distances by Single plane method.	**CO 4**
11	Setting out works – Foundation marking	**CO 5**
12	Distance and angular measurement using Total Station	**CO 5**
13	Measurement of height of building using Total Station	**CO 5**
14	Co-ordinates and distance measurement with GPS	**CO 5**

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
50	**50**

Outcomes

Upon completion of the course, the students will be able to:

CO1	Acquire knowledge about chain,compass and its accessories.
CO2	Understand the traversing, levelling & Plane table concepts.
CO3	Synthesize the boundary of an area by contouring and tachometry.
CO4	Analyze the elevation and distance by single plane and double plane method.
CO5	Create a topographical map using total station and GPS.

Laboratory Requirements

1. Chain
2. Compass
3. Plane table
4. Dumpy level
5. Theodolite
6. Total station

Reference Books

1. Basak N N, Surveying& Levelling, Tata McGraw-Hill Education,2nd Edition, 2014
2. Madhu, N, Sathiskumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2nd Edition, 2017.
3. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011 UG - Civil Engineering, Regulation 2019 56.
4. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2nd Edition, 2016.
5. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 4th Edition, 2012. 6. Seeber G, Satellite Geodesy , water De Gruyter, Berlin 1998.

Web Resources

1. https://nptel.ac.in/courses/105104100/
2. http://gen.lib.rus.ec/book/index.php?md5=1820B42F5CEB91750B86FB5159F34048

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2							2				
2	2									2			3	
3		2												
4	1		2							1			2	
5		2	1											

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Determination of area of given polygon by chain & cross-staff survey
2. Measurement of bearings of sides of traverse with prismatic compass.

COURSE OUTCOME 2:

1. Determination of elevation of various points with dumpy level by rise & fall method.
2. Locating given building by plane table surveying

COURSE OUTCOME 3:

1. Counter plan of given area
2. Measurement of horizontal angles theodolite by method of repetition

COURSE OUTCOME 4:

1. Determination of heights and distance by single plane method
2. Determination of heights and distance by double plane method

COURSE OUTCOME 5:

1. Locate and mark the foundation
2. Determination of distance using total station

21CE3511	COMPUTER AIDED BUILDING DRAWING LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- Engineering graphics

Objectives

1. To impart knowledge on Software capabilities for drafting and modelling
2. To impart knowledge on Different types of buildings & their views
3. To draw the Isometric, 2D and 3D views of the simple objects

S.No	List of Experiments	CO
	PART A	
1	Symbols and Conventions in building drawing	CO1
2	Drafting and annotation commands.	CO1
3	Simple Drawings I	CO1
4	Drawings using advanced commands	CO2
5	Simple Drawings II.	CO2
	PART B	
1	Planning of building based on as per building bye laws.	CO3
2	Joinery Details(Doors & Windows)	CO4
3	Plan, Section and Elevation of load bearing walls (Flat roof)	C05
4	Plan, Section and Elevation of load bearing walls (Sloped roof)	CO5
5	Plan, Section and Elevation of RCC framed structures	CO5
6	Plan, Section and Elevation of Industrial buildings	CO5
7	Perspective view of Residential buildings	CO4
8	Requirements of Drawings as per National Building Code	CO3

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)

50	**50**

Outcomes

Upon completion of the course, the students will be able to:

CO1	Draft drawings by using software.
CO2	Understand different type of construction elements in a building.
CO3	Learn the drawing as per National Building code.
CO4	Describe knowledge about building components.
CO5	Draw plan, section & elevation of different types of buildings & structures.

Laboratory Requirements

AutoCAD software

Reference Books

1. Subhash C Sharma &Gurucharan Singh, —Civil Engineering Drawing||, Standard Publishers, 7th Edition, 2014.
2. B.P. Verma, —Civil Engineering Drawing||, Khanna Publishers, New Delhi, 2006.
3. Dr. N. Kumara Swamy, A. KameswaraRao. "Building Planning and Drawing", Charotar Publishing House Pvt. Ltd., 7th Edition, 2014
4. 2. V.B Sikka, "A Course in Civil Engineering Drawing", S.K. Kataria& Sons, Delhi, 2012.

Web Resources

1. http://www.nptelvideos.in/2012/12/computer-aided-engineering-design.html

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1							2			3			2	
2				2	3		2	2		2		3	2	
3	3		3	3	3		3	1	3			3	2	
4		2	3	3			2	1		2			2	
5			2	2	3				2	3		3	2	

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Draw a Title Block with necessary Text and Projection Symbol.
2. Drawing of Curves for a) Parabola b) Spiral c) Involutes

COURSE OUTCOME 2:

1. Planning a residential building with lintel and sunshade.

2 . Draft a building with glazed and panelled doors and windows.

COURSE OUTCOME 3:

1. Draw a single room building.
2. Draw the plan, section, elevation of single floor office building.

COURSE OUTCOME 4:

1. Draft a Double bedroom building with R.C.C Roof.
2. Draw the plan, section, elevation of residential building with titled roofing.

COURSE OUTCOME 5:

1. Draw a industrial building with north roof light truss.
2. Draw the perspective view of the given room using Auto CAD.

21PT3902	VERBAL ABILITY	L	T	P	C
		2	0	0	1

Preamble:

This course is developed to enhance the Verbal competency of the students as Verbal Ability is commonly a part of the various competitive exams conducted. This course equips the students in all the aspects of grammar and helps to enhance comprehensive abilities and Analytical skills.

Prerequisites for the course

- Foundational English

Objectives

1. To help the student understand the importance of having his language skills kept ready for effective use.
2. To provide a host of varied opportunities for the student to hone his acquired language skills basic components, namely, Grammar, Vocabulary, Spelling and Comprehension.

Module I	**Error Identification**	**6**

Articles, Tenses, Voices, Preposition, Conjunctions, Subject-verb agreement, Adverbials.

Module II	**Sentence Structure**	**6**

Parts of speech, Simple, Complex & Compound Sentences, Direct & Indirect Speech, Kinds of Sentences, Degrees of Comparison, Clauses.

Module III	**Verbal Reasoning**	**6**

Reading Comprehension, Analogies, Synonyms & Antonyms, Idioms, One word substitutes.

Module IV	**Coherence and Cohesion**	**6**

Para-jumbles, Phrasal verbs, Modifiers, Punctuations, Misspelled words.

Module V	**Rhetorical reasoning**	**6**

Verbal syllogism, figures of speech.

Suggested Assessment Activities:

- MCQ test through Google forms or other online test platforms.
  Eg. JavaPoint - Verbal Ability https://www.javatpoint.com/verbal-ability

	Total Periods	**30**

Suggestive Assessment Methods

Formative Assessment Test	**Continuous Assessment Test 1**	**Continuous Assessment Test 2**

(20 Marks)	**(40 Marks)**	**(40 Marks)**
MCQ	**MCQ**	**MCQ**

Outcomes

Upon completion of the course, the students will be able to:

CO1: Identify the grammatical errors in a sentence.

CO2: Frame sentences using the correct syntax.

CO3: Understand the concepts stated in a sentence or paragraph and analyze using verbal reasoning.

CO4: Construct sentences logically and make the texts semantically meaningful as a whole.

CO5: Interpret and analyze texts on a deeper level.

Text Books

1. Wren, P.C., Martin, H, Prasada Rao, N.D.V. (1973–2010). High School English Grammar & Composition. New Delhi: Sultan Chand Publishers
2. Kumar, Sanjay, Pushp Latha. (2018) English Language and Communication Skills for Engineers, India: Oxford University Press.

Reference Books

1. Guptha S C, (2012) Practical English Grammar & Composition, 1 st Edition, India: Arihant Publishers
2. Steven Brown, (2011) Dorolyn Smith, Active Listening 3, 3 rd Edition, UK: Cambridge University Press.

Web Resources:

1. Indiabix : https://www.indiabix.com/online-test/verbal-ability-test/
2. All India Exams : https://www.allindiaexams.in/online-test/online-verbal-ability-test/all
3. faceprep: https://www.faceprep.in/verbal-ability/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	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
1										3		1			
2										3		1			
3										3		1			
4										2		1			

5										2		1			

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	30	50	5	5	50
ANALYSE	10	20	5	5	20
EVALUATE					
CREATE					

COURSE CONTENT AND LECTURE SCHEDULE

S. No	Topics to be covered	No. of Hours Needed
	MODULE I - READING AND STUDY SKILLS (6)	
1	Articles	1
2	Tenses	1
3	Voices	1
4	Preposition & Conjunctions	1
5	Subject Verb Agreement	1
6	Adverbials	1
	MODULE II - INTRODUCTION TO PROFESSIONAL WRITING (6)	
7	Parts of Speech	1
8	Simple, Compound & Complex Sentences	1
9	Direct & Indirect Speech	1
10	Kinds of Sentences	1

11	Degrees of Comparison	1
12	Clauses	1
MODULE III - INTERVIEW SKILLS (6)		
12	Reading Comprehension	1
14	Analogies	1
15	Synonyms & Antonyms	1
16	Idioms	1
17	One word Substitute	1
18	One word Substitute	1
MODULE IV – REPORT WRITING I (6)		
19	Para Jumbles	1
20	Para Jumbles	1
21	Phrasal Verbs	1
22	Modifiers	1
23	Punctuation	1
24	Misspelled words	1
MODULE V - REPORT WRITING II (6)		
25	Verbal Syllogism	1
26	Verbal Syllogism	1
27	Verbal Syllogism	1
28	Figures of Speech	1
29	Figures of Speech	1
30	Figures of Speech	1

SEMESTER IV

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21HS1104	தமிழரும் தொழில்நுட்பமும் / Technology in Tamil Culture	HSSM	2	2	0	0	1
2	21HS3101	Ethical and Moral Values	HSSM	3	3	0	0	3
3	21CE4601	Concrete Technology	PC	3	3	0	0	3
4	21CE4602	Fluid Mechanics and Hydraulic Machines	PC	3	3	0	0	3
5	21CE4603	Strength of Materials II	PC	3	3	0	0	3
6	21CE4604	Soil Mechanics	PC	3	3	0	0	3
Theory cum practical								
1	21CE4605	Highway Engineering	PC	5	3	0	2	4
Practical Courses								
1	21CE4611	Hydraulic Engineering Laboratory	PC	4	0	0	4	2
2	21CE4612	Construction Materials Laboratory	PC	4	0	0	4	2
Employability Enhancement Course								
1	21MA4001	Aptitude I	EEC	2	0	0	2	1
Mandatory Courses								
1	21GE2M02	Environmental and Sustainable Engineering	MC	2	2	0	0	0
			Total	**33**	**21**	**0**	**12**	**25**

21HS2103	**TECHNOLOGY IN TAMIL CULTURE**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**1**

Preamble:

This course is offered to develop technical thinking based on Tamil tradition and to acquaint students with the fundamentals of various technologies through Tamil culture and history.

Prerequisite: The prerequisite knowledge required to study this course is basic knowledge in English and Tamil Heritage.

UNIT I	**WEAVING AND CERAMIC TECHNOLOGY**	**6**

Weaving Industry during Sangam Age–Ceramic technology–Black and Red Ware Potteries (BRW) – Graffition Potteries

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	6
Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero Stones of Sangam Age– Details of Stage Constructions in Silapathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal -Chetti Nadu Houses, Indo –Saracenic architecture at Madras during British Period.		
UNIT III	**MANUFACTURING TECHNOLOGY**	**6**
Art of Ship Building - Metallurgical studies- Jewells making - Iron industry - Iron smelting, steel - Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads -Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gemstone types described in Silapathikaram.		
UNIT IV	**AGRICULTURE AND IRRIGATION TECHNOLOGY**	**6**
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea – Fisheries – Pearl-Conceiving-Ancient Knowledge of Ocean-Knowledge Specific Society.		
UNIT V	**SCIENTIFIC TAMIL & TAMIL COMPUTING**	**6**
Development of Scientific Tamil – Tamil computing–Digitalization of Tamil Books–Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries –Sekai Project.		
Total Periods		**30**

Course Outcomes:

At the end of the course the students will be able to

CO1	To learn the techniques adopted in Industries of ancient Tamil culture.
CO2	To assess the technical competence of ancient Tamil.
CO3	To achieve the ability to think about various production technologies in Tamil Culture.
CO4	To explore the recovery and development of agricultural and water management technical skills of Tamil culture.
CO5	To enumerate the technical development that Tamil has achieved in the field of science and computer.

CO PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12

1								**1**	**2**	**3**	**1**	**3**
2								**1**	**3**	**2**	**3**	**2**
3								**1**	**3**	**2**	**1**	**2**
4								**3**	**2**	**2**	**3**	**2**
5								**2**	**3**	**3**	**2**	**3**

TEXT-CUM-REFERENCEBOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL–(in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Keeladi-'Sangam City Civilization on the bank of river Vaigai'(Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published By: TheAuthor)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) Journey of Civilization Industo Vaigai (R.Balakrishnan) (Published by:RMRL)–Reference Book

21HS2103	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		2	0	0	1

முன்னுரை(Preamble)

இந்தப் பாடத்திட்டம் பொறியியல் பயிலும் முதலாம் ஆண்டு மாணவர்களின் இரண்டாம் பருவத்திற்குரியது. தமிழ் மரபு சார்ந்த தொழில்நுட்ப சிந்தனையை வளர்த்து பல்வேறு தொழில்நுட்பங்களின் அடிப்படை கூறுகளைத் தமிழரின் பண்பாடு மற்றும் வரலாற்றின் மூலம் மாணவர்களை அறியச் செய்தல்.

பாடநெறிக்கான முன்நிபந்தனைகள்(Prerequisites for the course)

தமிழ் மொழியில் எழுத படிக்க தெரிந்திருத்தல் **அ**வசிய**ம்**.		
அலகு I	**நெசவு மற்றும் பானைத் தொழில்நுட்பம்**	**6**
சங்க காலத்தில் நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்		
அலகு II	**வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்**	**6**
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத்தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல் , மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை		
அலகு III	**உற்பத்தித் தொழில் நுட்பம்**	**6**
கப்பல் கட்டும் கலை - உலோகவியல் - நகை**த் தொழில்நுட்பம்** - இரும்பு தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்று சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள் கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்பு துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்		
அலகு IV	**வேளாண்மை மற்றும் நீர் பாசன தொழில்நுட்பம்**	**6**
அணை , ஏரி, குளங்கள், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்து குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்		
அலகு V	**அறிவியல் தமிழ் மற்றும் கணினித் தமிழ்**	**6**
அறிவியல் தமிழின் வளர்ச்சி - கணினித் தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணைய கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.		
Total Periods		**30**

எதிர்பார்க்கும் படிப்பின் முடிவுகள்

CO1	**மாணவர்கள் பண்டைத் தமிழரின் தொழில்நுட்பங்களை அறிந்து கொள்வர்.**
CO2	**பண்டைத் தமிழரின் தொழில்நுட்பத் திறனை மதிப்பிடுதல்.**
CO3	**தாய் மொழியில் பல்வேறு உற்பத்தி தொழில்நுட்பங்களைக் குறித்து சிந்திக்கும் திறனை அடைவார்.**
CO4	**தமிழரின் வேளாண்மை மற்றும் நீர் மேலாண்மை தொழில்நுட்ப திறன்களை மீட்டு உருவாக்கம் செய்தல் குறித்து அறிதல்.**
CO5	**அறிவியல் மற்றும் கணினி துறையில் தமிழ்ப் பெற்றுள்ள தொழில் நுட்ப வளர்ச்சியை அறிதல்.**

Course Outcomes:

At the end of the course the students will be able to

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
1		1			1		1	1	2	1		3
2		2	2		2	1	3	2	1	2		2
3		2	3	1	2	1	1	1	2	1		2
4			2				2	1	2	2		2
5			2				1	2	1	3		1

TEXT – CUM – REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம்(விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

21HS3101	Ethical and Moral Values	L	T	P	C
		3	0	0	3

Preamble:

The course is designed with the purpose of helping students in developing a holistic perspective about life. It opens the space for the student to explore his/her role (value) in all aspects of living – as an individual, as a member of a family, as a part of the society and as a unit in nature.

Prerequisites for the course

- Nil

Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession.
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

MODULE 1	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	9

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Suggested Activities:

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

MODULE 2	Understanding Harmony in the Human Being - Harmony in Myself	9

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha (happiness and physical facility)
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'.
5. Understanding the harmony of I with the Body: Sanyam(control) and Swasthya (Health); correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure Sanyam and Swasthya

Suggested Activities:

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss programs for ensuring health vs dealing with disease.

MODULE 3	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**	**9**

1. Understanding harmony in the Family- the basic unit of human interaction
2. Understanding values in human-human relationship; meaning of *Nyaya* (justice) and program for its fulfillment to ensure *Ubhay-tripti* (mutual happiness)
3. Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
4. Understanding the meaning of *Vishwas*; Difference between intention and competence
5. Understanding the meaning of *Samman* (respect), Difference between respect and differentiation; the other salient values in relationship
6. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* (Resolution, Prosperity, fearlessness, co-existence) as comprehensive Human Goals

Suggested Activities:

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss scenarios. Elicit examples from students' lives. Pay a visit to the old age home / orphanage / physically & mentally challenged asylum and support them in catering their needs to ensure mutual happiness.

MODULE 4	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**	**9**

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
3. Understanding Existence as Coexistence (*Sah-astitva*) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence

Suggested Activities:

Include practice sessions to discuss human beings as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc. Submit a video documentary highlighting the ways of humans creating an imbalance in nature and ways to prevent it.

MODULE 5	**Implications of the above Holistic Understanding of Harmony on Professional Ethics**	9

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in Professional Ethics:
   a) Ability to utilize the professional competence for augmenting universal human order,

   b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order

Suggested Activities:

Include a presentation session on identifying human inventions that are non eco friendly and brainstorming to come up with eco friendly production systems or eco friendly alternatives.

Total Periods	**45**

Outcomes

Upon completion of the course, the students will be able to:

1.Understand the significance of value inputs in a classroom and start applying them in their life and profession

2.Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.

3.Understand the value of harmonious relationship based on trust and respect in their life and profession

4.Understand the role of a human being in ensuring harmony in society and nature.

5.Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
Descriptive Questions	Google Form based - on-lineTest	Descriptive Questions

CO Vs PO Mapping and CO Vs PSO Mapping

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
1						2	1	3	1	1	1	1		
2						2	1	3	1	1	1	1		
3						2	2	3	1	1	1	1		
4						1	2	3	1	1	1	2		
5						1	2	3	1	1	1	2		

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**FAT 1**	**FAT 2**	**END SEM EXAM**
REMEMBER	30	30	05	05	20
UNDERSTAND	20	20	10	10	20
APPLY	20	20	05	05	20
ANALYZE	20	20	05	05	20
EVALUATE	10	10			20
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Self exploration is a process of dialogue between ‘what you are’ and ‘what you really want to be’. Explain and illustrate.
2. How can we verify proposals on the basis of our natural acceptance?Explain with examples.

COURSE OUTCOME 2:

1. Distinguish between Sukh and Suvidha in detail taking needs of yourself as an example.

2. Activities of knowing, assuming, recognizing and fulfilling in the self. ('I').

COURSE OUTCOME 3:

1. What is the meaning of justice in human relationships? How does it follow from family to world family?
2. What is the meaning of respect? How do we disrespect others due to a lack of right understanding of this feeling?

COURSE OUTCOME 4:

1. What do you mean by 'innateness'? What is the innateness in the four orders?
2. What are the natural characteristics (Swabhava) of human order?

COURSE OUTCOME 5:

1. 'When there is no utility there is no scope for art too' Explain.
2. What do you mean by definitiveness of ethical human conduct? How can it be ensured?

21CE4601	CONCRETE TECHNOLOGY	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Nil

Objectives

1. The properties of all the materials used in concrete.
2. The different kinds of admixtures.
3. The different mix design methods.
4. The properties and tests carried out on fresh and hardened concrete.
5. The special concretes and concreting methods.

UNIT I	CONSTITUENT MATERIALS OF CONCRETE AND ADMIXTURES	10

Concrete - Constituent materials - Cement - Manufacturing and chemical composition - Types and grades - Mechanism of hydration - Aggregates - Water - Properties and tests - Necessity - Types - Chemical admixtures with specific properties - Accelerators, retarders, plasticizers and super plasticizers - Water proofers - Mineral admixtures - Fly ash, slag, GGBS and Silica fume - Mineral additives and fillers.

UNIT II	MIX DESIGN	9

Concept, principles and influencing factors - Mix Design Methods - ACI code, British code and BIS code methods - Assumptions - Advantages and limitations - Sampling and acceptance criteria – Quality assurance and control - Design Examples(Mix Design).

UNIT III	FRESH STATE PROPERTIES OF CONCRETE	8

Workability - Tests for workability of concrete – Slump cone test – Compaction factor – Vee Bee consistometer – Marsh cone test – V Funnel test – J Ring test - Segregation and Bleeding – Setting time test – Vicat apparatus test - Plastic shrinkage – Soundness test - le chatelier apparatus test - Hydration

UNIT IV	HARDENED STATE PROPERTIES OF CONCRETE	9

- Determination of strength Properties of Hardened concrete - Compressive strength – split tensile strength - Flexural strength - Stress-strain curve for concrete - Modulus of elasticity – durability of concrete – water absorption – permeability – corrosion test – acid resistance.

UNIT V	SPECIAL CONCRETES AND CONCRETING METHODS	9

Ready Mix Concrete - Lightweight concrete - Fiber Reinforced Concrete - Polymer concrete - Ferro-cement – Self Compacting Concrete, High Strength Concrete, High Performance Concrete - Bio and bacterial concrete - Geopolymer Concrete - Smart concrete - Extreme weather concreting - Vacuum dewatering concreting - Underwater concreting - Guniting and shotcreting.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Evaluate the properties of materials used in concrete
CO2: Apply mix proportion principles to design a concrete mix by using IS code.
CO3: Determine the workability of fresh concrete with different testing methods.
CO4: Diagnose the strength and durability of hardened concrete with different testing methods
CO5: Choose suitable materials for making special concrete and employ the concrete methods.

Text Books

1. M.S.Shetty., "Concrete Technology, Theory & Practice", S. Chand and Co, New Delhi, 7th Edition, 2018.
2. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency,2010.
3. Bhavikatti.S.S, " Concrete Technology", I.K.International Publishing House Pvt. Ltd., New Delhi,2015
4. Santhakumar. A.R., "Concrete Technology", Oxford University Press India, 2006.

Reference Books

1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London,1995
2. Gambhir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
3. IS10262-2009 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998

Web Resources

1. **https://nptel.ac.in/courses/105102012/**
2. **https://nptel.ac.in/courses/105106176/**
3. **https://nptel.ac.in/courses/105104030/**

CO Vs PO Mapping and CO Vs PSO Mapping

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
1	1	1				1	1					1		
2	3	2	2	3		2	2					2		
3	2	1			2	2	1					1		
4	3	2			2	2	1					1		
5	3	2			2	2	1					1		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	50	30	50	50	30
Understand	50	50	50	50	50
Apply		20			20
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain in detail about the various types of cement
2. Explain in detail about the mechanical properties of aggregate

COURSE OUTCOME 2:

1. Explain in detail about the types of chemical admixtures
2. Explain in detail about the types of mineral admixtures

COURSE OUTCOME 3:

1. Explain the concept of mix design and mention the method of proportioning
2. Explain the procedure of IS Mix design

COURSE OUTCOME 4:

1. Explain the properties of fresh and hardern concrete
2. Explain the test of compressive and tensile strength of concrete

COURSE OUTCOME 5:

1. Explain the light weight concrete?
2. Explain polymer concrete?

21CE4602	FLUID MECHANICS AND HYDRAULIC MACHINES	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Engineering Physics

Objectives

1. To understand the basic properties and Static, dynamic and kinematic characteristics of fluid.
2. To solve the practical problems involving fluid statics, dynamics, pumps and turbines.

UNIT I	FLUID PROPERTIES AND FLUID STATICS	9

Dimensions and units - Properties of fluids – density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension (Problem) – Fluid statics: concept of fluid static pressure, absolute and gauge pressures – pressure measurements by manometers - Problem.

UNIT II	FLUID KINEMATICS AND DYNAMICS	9

Fluid kinematics : Classification of fluid flow - Streamline, streak line and path line - Convective and local acceleration - Continuity equation for one, two dimensional flows - Stream function and velocity potential function. Fluid dynamics: Pressure, kinetic and datum energy - Euler's equations of motion -Bernoulli's theorem – practical application of Bernoulli's equation (Problem).

UNIT III	FLOW THROUGH PIPES	9

Laminar flow through circular pipe (Hagen poiseuille's)– 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 IV	DIMENSIONAL ANALYSIS	9

Dimensional homogeneity - Rayleigh's method, Buckingham Pi theorem- Problem - Non-dimensional numbers - Model laws and distorted models - Modelling and similitude - design.

UNIT V	HYDRAULIC MACHINES	9

Types of pumps - Properties of centrifugal pump - Pump characteristics - Specific speed, NPSH, slip - Reciprocating pump - Indicator diagram - Classification of turbines – Working of various turbines - Efficiency of turbines (Problem).

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test	Formative Assessment Test	End Semester Exams (60 Marks)

(30 Marks)	**(10 Marks)**	
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1 Explain the fundamental properties of fluids and methods of pressure measurement in fluidstatics
CO2 Infer fundamentals of fluid kinematics and dynamics and their applications in hydraulicexperiments
CO3 Identify the factors affecting flow through pipes to estimate the losses
CO4 Assess the performance of a model by dimensional analysis and similitude
CO5 Compute the efficiency and performance of pumps and turbines

Text Books

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

Reference Books

1. White, F.M., "Fluid Mechanics", Tata McGraw Hill, 5th Edition, New Delhi, 2017.
2. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, New Delhi,2015.

Web Resources

1. https://nptel.ac.in/courses/105/103/105103192/
2. https://nptel.ac.in/courses/105/103/105103021/

CO Vs PO Mapping and Mapping CO Vs PSO

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2										2	
2	3	2	2										2	
3	3	2	2										2	
4	2	3	2										2	
5	2	3	2									2	2	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	30	30	30	30	30
Apply	60	60	60	60	60
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Describe the following properties of the fluid with the values of water at standard temperature and pressure: (1) Mass Density (2) Specific Weight (3) Specific Gravity (4) Viscosity.
2. Explain centre of pressure and total pressure, also derive an expression for it.

COURSE OUTCOME 2:

1. Compute the form of velocity potential if exits with proof and also find the stream function in a two dimensional incompressible flow if the fluid velocity components are given by u=x-4y and v= -y-4x.
2. Derive two dimensional continuity equation in Cartesian co-ordinate system.

COURSE OUTCOME 3:

1. Derive the Hagen-Poiseuille's equation for laminar flow of fluid in straight and circular pipe with proper assumption with neat sketch.
2. Determine (i) Reynolds number of flow (ii) Centre line velocity (iii) wall shear stress and (iv) power required to maintain the flow, for an oil of velocity 1 poise and specific gravity 0.8 is flowing through 50mm diameter pipe of length 500m at the rate of 1.9 litres/sec.

COURSE OUTCOME 4:

1. Explain the procedure for dimensional analysis by Buckingham Pi theorem.
2. The lift force F on a missile is a function of its length L, velocity V, diameter D, angle of attack α, density ρ, viscosity μ, and speed of sound C of the air. Find the functional relationship in dimensional form.

COURSE OUTCOME 5:

1. What is the minimum starting speed of a centrifugal pump? Obtain an expression for the minimum starting speed of a centrifugal pump.
2. Explain with a neat sketch the construction details and working principles of reciprocating pump.

21CE4603	STRENGTH OF MATERIALS II	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Mechanics for Civil Engineering
- Mechanics of Solids

Objectives

1. To know the method of finding slope and deflection of beams and trusses using energy theorems and to know the concept of analyzing indeterminate beam
2. To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.

UNIT I	ENERGY PRINCCIPLES	9

Strain energy – strain energy due to axial load (gradual, sudden and impact loads), shear, flexure and torsion – Castigliano's theorems- Maxwell's reciprocal theorems - Principle of virtual work – application of energy theorems for computing deflections in beams and trusses.

UNIT II	INDETERMINATE BEAMS	9

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

UNIT III	COLUMNS AND CYLINDER	9

Euler's theory of long columns – critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns – Eccentrically loaded short columns -Thin cylindrical and spherical shells – stresses and change in dimensions

UNIT IV	STATE OF STRESS IN THREE DIMENSIONS AND THEORIES OF FAILURE	9

Determination of principal stresses and principal planes in three dimensions – Volumetric strain –Theories of failure – Principal stress - Principal strain – shear stress – Strain energy and distortion energy theories – Application in analysis of stress, load carrying capacity

UNIT V	ADVANCED TOPICS IN BENDING OF BEAM	9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams – Winkler Bach formula**.**

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Written Test	MCQ	Written Test

Outcomes

Upon completion of the course, the students will be able to:

CO404.1 Acquire knowledge about strain energy due to axial load, shear, flexure and torsion
CO404.2 Illustrate the bending moment and shear force in indeterminate beams.
CO404.3 Evaluate the failure of columns and stresses in thin cylinders
CO404.4 Determine the principal stress and principal strain using various theories of failures.
CO404.5 Assess the unsymmetrical bending in beam sections and stresses in curved beams.

Text Books

1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007 .
2. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012.

Reference Books

1. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009. .
2. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003 .
3. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing Company, 2007
4. PunmiaB.C."Theory of Structures" (SMTS) Vol I&II, Laxmi Publishing Pvt Ltd, New Delhi 2004.
5. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011
6. R.K.Bansal "Strength of Materials", Lakshmi Publications Pvt Ltd, New Delhi, 2018

Web Resources

1. https://nptel.ac.in/courses/105105108/
2. https://nptel.ac.in/content/syllabus_pdf/105105108.pdf
3. https://nptel.ac.in/courses/112101095/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	1	1							2	3	
2	3	3	3	1	1							2	3	
3	3	3	3	1	1							2	3	
4	3	3	3	1	1							2	3	
5	3	3	3	1	1							2	3	
6	3	3	3	3	1							2	3	

BLOOMS LEVEL ASSESSMENT PATTERN

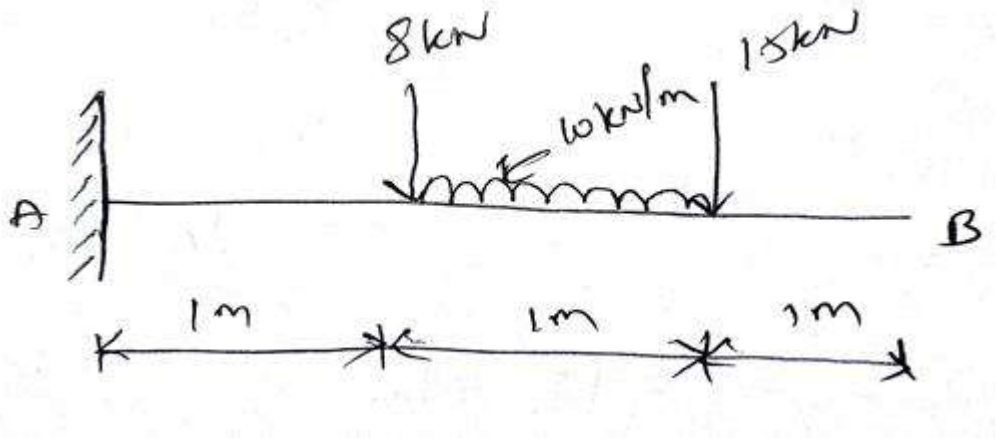
BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	10	10	10	10	10

Apply	50	50	50	50	50
Analyze	30	30	30	30	30
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

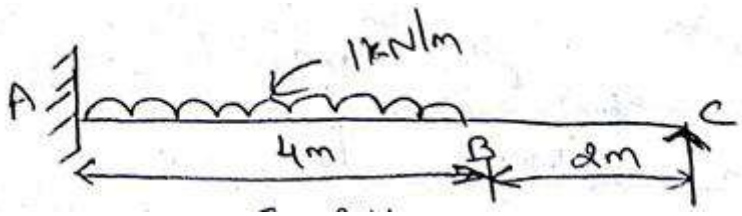
1. Using Castigliano's theorem determine the deflection at the free end of the cantilever beam as shown in the fig. Take EI = 5 MNm2.



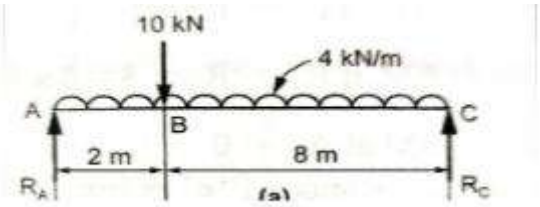
2. A simply supported beam of length 6m carrying a point load of 45kN at a distance of 2m from the left support. Using Unit load method, find the deflection under the point load. Take EI=2.2 MNm2.

COURSE OUTCOME 2:

1. A cantilever ABC is fixed at A and rigidly propped at C and loaded as shown in the fig. Find the reaction at C and Draw BMD and SFD. Also find the point of Maximum bending moment and point of Contraflexure.



2. A continuous beam ABC fixed at the ends of spans AB and BC of length 6m and 4m respectively. The span AB carries a UDL of 10kN/m and the span BC carries a UDL of 20kN/m. Draw BMD and SFD.



COURSE OUTCOME 3:

1. From the following data column of circular section calculate the extreme stresses on the circular section, also find the maximum eccentricity in order that there may be no tension anywhere on the section.

   External diameter =20 cm

   Internal diameter = 16 cm

   Length of column = 4m

   Load carries by the column = 200 kN

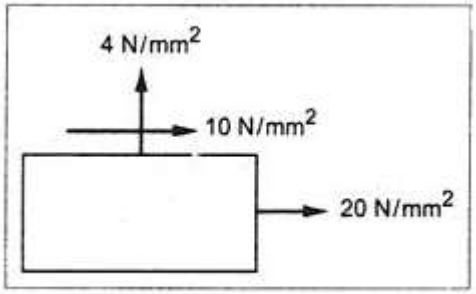
   Eccentricity of load = 2.5 cm from the axis of the column

   End condition = both end fixed

2. A cylindrical thin drum 80cm in diameter and 3m long has a shell thickness of 1cm. If the drum is subjected to an internal pressure of 2.5 N/mm2 , determine (i) change in diameter (ii) change in length and (iii) change in volume E=2×105N/mm2 and poisons ratio=0.25

COURSE OUTCOME 4:

3. For the state stress shown in fig. Find the principal plane and principal stress and maximum shear stress.



4. Explain the following theories of failure.

   i. Maximum principal stress theory.

   ii. Maximum principal strain theory.

   iii. Maximum strain energy theory.

   iv. Maximum Shear Stress theory.

COURSE OUTCOME 5:

3. Find the shear center of the channel section 300mmx 150mm with thickness of 20mm from first principles.
4. A curved bar is formed of a tube of 120mm outside diameter and 7.5 mm thickness. The centre line of this curved bar is a circular arc of radius 225 mm. A bending moment of 3 kNm tending to increase curvature of the bar is applied. Calculate the maximum tensile and compressive stresses setup in the bar

21CE4604	SOIL MECHANICS	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Engineering Geology

Objectives

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

UNIT I	SOIL CLASSIFICATION	9

Soil formation and nature of soils- Phase diagrams-Basic definitions and inter-relationships–IndexPropertiesofsoils-ClassificationbasedonBIS.Compaction-Factorsaffectingcompaction-Laboratory &Field Compaction methods.

UNIT II	EFFECTIVE STRESS	9

Soil water - Various forms - Static pressure in water - Total - Neutral and effective stress distribution in soils - Liquefaction &quicksand conditions. Flow of water through soils - Darcy's law; Assumptions and validity - Permeability - Coefficient of permeability – Factors affecting permeability- Permeability of stratified deposits of soils - Laboratory tests - Seepage analysis.

UNIT III	STRESS DISTRIBUTION	9

Boussinesqs and Wester Guard's theories of stresses due to concentrated loads - Circular, Rectangularload-Striploa d-NewMark'schart.Consolidation-Fundamentaldefinitions-Spring analogy -Terzaghi's one-dimensional consolidation theory - Assumptions, limitations and applications –Pre-consolidation pressure and its determination - Normally, under and over consolidated soils

UNIT IV	SHEAR STRENGTH OF SOILS	9

Shearstrength-Factorsaffectingshearstrengthofsoils-Mohr-Coulombtheory-Measurement ofshearstrengthparameters-Directshear-Unconfinedcompression-Triaxial-Drained and undrained conditions- Vane shear tests.

UNIT V	STABILITY OF SLOPES	9

Typesofslopes–Failuremechanismofslopes-Totalandeffectivestressanalysis–Finiteslopes-Stability analysis for purely cohesive and-phisoils–Method of slices-Friction circle method-Taylor's Stability number - Slope protection methods

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Classify the soil based on index properties and understand the compaction process.
CO2: Determine the stress distribution and the permeability of soils.
CO3: Evaluate the vertical stress due to external loads and consolidation settlement of clayey soils.
CO4: Compute the shear strength parameters of soils under different drainage conditions.
CO5: Analyze the stability of slopes and provide slope protection methods.

Text Books

1. B.N.D.NarasingaRao,SoilMechanicsandFoundationEngineering,WileyIndiaPvt.Ltd.,New Delhi,2015.
2. B.C.Punmia,SoilMechanicsandFoundations,LaxmiPublicationsPvt.Ltd.,NewDelhi,2005.

Reference Books

1. AlamSingh,SoilEngineeringinTheoryandPractice,AsiaPublishingHouse,Bombay, 2ndEdition,2009.
2. BrajaM.Das,PrinciplesofGeotechnicalEngineering,ThomsonBrooks/Cole,Australia,8th Edition,2015.
3. KarlTerzaghi,SoilMechanicsinEngineeringPractice,3rdedition,JohnWiley&Sons,Inc, 1995.
4. 4. IS Codes: IS 1498: 1970, IS 2810: 1979, IS 2809: 1972, IS 2720 : Part 1 to Part 41

Web Resources

1. https://www.kobo.com/us/en/ebook/introduction-to-soil-mechanics.
2. https://easyengineering.net/geotechnical-engineering-book-by-c-venkatramaiah/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2		3										
2	3	3											2	
3	3	3												
4	3	3		3										
5	3	2	1	2									3	

21CE4605	HIGHWAY ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Matrices and Calculus

Objectives

To impart knowledge on

1. Highway planning & Alignment
2. Highway materials & Design of pavements
3. Evaluation & Highway maintenance
4. Basics concepts of Traffic Engineering
5. Modern Traffic Engineering

UNIT I	INTRODUCTION & GEOMETRIC DESIGN OF HIGHWAYS	9

Classification of roads – Planning & Alignment of roads – Road patterns - Geometric design of highways - Cross sectional elements - Sight distances – Horizontal & Vertical curves - Super elevation - -widening at curves – Gradients & its types

UNIT II	HIGHWAY MATERIALS & DESIGN OF PAVEMENTS	9

Highway materials - Desirable properties and testing of course aggregates, Bitumen & Bituminous mixes - Design factors of Flexible & Rigid pavements - Design of flexible & rigid pavements by IRC codes -Construction of pavements (Rigid & Flexible)

UNIT III	EVALUATION & MAINTANANCE OF PAVEMENTS	9

Pavement distress in flexible and rigid pavements – Types of maintenance – Pavement Management Systems - Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements – Strengthening of pavements –Highway Project formulation - Highway drainage

UNIT IV	INTRODUCTION TO TRAFFIC ENGINEERING	9

Traffic studies on flow and speed, peak hour factor - Role of GIS in Traffic Congestion Studies, accident study, statistical analysis of traffic data, Microscopic & Macroscopic parameters of traffic flow, fundamental relationships, Traffic signs – Signal design by Webster's method (only design considerations) – Type of intersections – Highway capacity

UNIT V	MODERN TRENDS IN HIGHWAY ENGINEERING	9

Role of Highways in Smart cities - Intelligent transportation system (ITS) – Exclusive Bus Bays – Bicycle Lane – Modern Pedestrian bridges – Automated parking system (APS) – Case study on Grade Separators – Integrated Transportation Systems – Modern Highway Construction machineries

S.No	List of Experiments	CO
1	Aggregate Crushing Test	CO1
2	Aggregate Impact Test	CO1
3	Los Angeles Abrasion Test	CO2
4	Penetration test of bitumen	CO2
5	Ductility test of bitumen	CO3
6	Softening point of bitumen	CO3
7	Flash and fire point test	CO4
8	Vee bee consistency test	CO4
9	Marshal Stability Test	CO5
10	California Bearing Ratio Test	CO5
	Total Periods	**30 Theory +30 Lab**

Laboratory Requirements for a batch of 60 Students

1. Aggregate Crushing Test apparatus
2. Aggregate Impact Test apparatus
3. Los Angeles Abrasion Test apparatus
4. Penetration test of bitumen apparatus
5. Ductility test of bitumen apparatus
6. Softening point of bitumen apparatus
7. Flash and fire point test machine
8. Vee bee consistency test machine
9. Marshal Stability Test machine
10. California Bearing Ratio Test apparatus

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Lab Components Assessments (20 Marks)	End Semester Exams (50 Marks)
1. Written Examination	1. Completion of Suggested Exercises	1. Written Examination

Outcomes

Upon completion of the course, the students will be able to:

CO405.1 Gain knowledge on basics of Highways & Geometric design of highways
CO405.2 Understand the concept of Design flexible and rigid pavements
CO405.3 Gain knowledge on Highway construction materials, properties, testing methods, Evaluation & maintenance of pavements
CO405.4 Gain knowledge on & Traffic Engineering

CO405.5 Be Aware of Modern trends in Highway Engineering
Text Books
1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014. 2. Kadiyali L R , "Traffic Engineering and Transport Planning", Khanna Publishers, 2014 3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.
Reference Books
1. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision), IRC: 37- 2012 2. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2012 3. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Nineth Impression, South Asia, 2012 4. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, Ist Edition, USA, 2011 5. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011 6. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010 7. O'Flaherty.C.A "Highways, Butterworth – Heinemann, Oxford, 2006 8. IRC-37–2012,The Indian roads Congress, Guidelines for the Design of Flexible Pavements, New Delhi 9. IRC 58-2012. The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways, New Delhi
Web Resources 1. https://nptel.ac.in/courses/105/101/105101087/ 2. https://nptel.ac.in/courses/105/105/105105107/ 3. https://nptel.ac.in/courses/105/101/105101008/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
1	1												1	
2	2	2											2	
3	1	1	1	2				1					1	2
4	3	3	1	3				2					3	2
5	1	1	3	1	1	3	1		1	1	2	1	1	3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	Lab Components	Model Exam	End Semester Examination
Remember	20	20		20	20
Understand	40	40	10	40	40
Apply	30	30	5	30	30
Analyze	10	10	5	10	10
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Give a detailed study on the widening at curves(also mention the formulas)
2. Why Super elevation is required in curves?

COURSE OUTCOME 2:

1. What are the modern construction materials used for the construction of pavements? Explain their characteristics and usage in detail.
2. What are the Design factors in Flexible & Rigid pavement? Explain

COURSE OUTCOME 3:

1. Describe highway maintenance management systems.
2. List any eight cracks and defects in flexible pavements and describe their respective symptoms, possible causes and the treatment/ repair for each defect

COURSE OUTCOME 4:

1. List out the design considerations for Signal design by Webster's method
2. List out the Type of intersections. Also Explain the Microscopic & Macroscopic parameters of traffic flow

COURSE OUTCOME 5:

1. Explain about Intelligent transportation system (ITS)
2. Define Grade separators. Also give a Case study about the problems faced in Grade separators. Give a solution for the same.

21CE4611	HYDRAULIC ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- Fluid Mechanics and Hydraulic Machines

Objectives

Students should be able to verify the principles studied in theory by performing the experiments in lab.

Sl.No	List of Experiments	CO
1	Calibration of Rotameter	1
2	Calibration of Venturimeter / Orificemeter	1
3	Determination of friction factor in pipes	2
4	Determination of minor losses	2
5	Characteristics of Centrifugal pumps	3
6	Characteristics of Gear pump	3
7	Characteristics of Submersible pump	4
8	Characteristics of Reciprocating pump	4
9	Characteristics of Pelton wheel turbine	4
10	Characteristics of Francis turbine/Kaplan turbine	5
11	Determination of Metacentric height of floating bodies	5

Total Periods: 60

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
Experiment	Experiment

Outcomes

Upon completion of the course, the students will be able to:

CO1 Estimate the Co-efficient of discharge for orifice and notches

CO2 Experiment the venturimeter and orifice meter for their discharges

CO3 Understand the flow measurement in a pipe flow

CO4 Determine the energy loss in pipe flow

CO5 Study the characteristics of turbines and pumps.

Text Books

1. Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
2. Jain.A.K.., "Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.

Reference Books

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

Web Resources

3. https://nptel.ac.in/courses/105103096/
4. https://nptel.ac.in/courses/105105203/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1			2			1	2	1		2	2	
2	1	1			2			1	1	1		2	2	
3			1	1	2			1	2	1		2	2	
4	1	1	2	2	1			2	2			2	2	
5			1	2	1			1		1		3	2	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model exam+ Rubric based (50 marks)	END SEM PRACTICAL EXAM (50 marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Determine the flow of water through Venturimeter.
2. Determine the flow of water through Orificemeter.

COURSE OUTCOME 2:

1. Determine the minor loss through pipe.
2. Determine the friction factors in pipes.

COURSE OUTCOME 3:

1. Determine the water flow through centrifugal pump and its efficiency.
2. Determine the water flow through gear pump.

COURSE OUTCOME 4:

1. Determine the water flow through Submersible pump and its efficiency.
2. Determine the water flow through Reciprocating pump.

COURSE OUTCOME 5:

1. Determine the efficiency of kaplan turbine.
2. Determine the metacentric height of floating bodies.

21CE4612	CONSTRUCTION MATERIALS LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- Construction material, techniques and practices

Objectives

To impart knowledge on

To learn the principle and procedure of testing construction materials and to get hands on experience by conducting the tests and evolving inferences.

S.No	List of Experiments	CO
	LIST OF EXPERIMENTS	
1	Grading of coarse aggregates	1
2	Test for specific gravity and test for bulk density	1
3	Compacted and loose bulk density of fine aggregate	1
4	Sieve analysis and bulk density test	1
5	Specific gravity test of fine aggregate	1
6	Determination of elongation index and flakiness index	1
7	Fineness and setting time test	1
8	Soundness Test	1
9	Test for Slump cone	1
10	Test for Compaction factor	1
11	Vee bee consistometer test	1
12	Flow table Test	1
13	Rebound hammer Test	1
14	Test for Flexural strength	1
15	Test for Compressive strength of Cube	1
16	Test for Split tensile strength	1

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
1. EXPERIMENTS 2. Observation	1. EXPERIMENTS 2. Record note

3. Viva voce	3. Viva voce

Outcomes

Upon completion of the course, the students will be able to:

CO408.1 Students will have the required knowledge in the area of testing of construction materials and components of construction elements experimentally.

Reference Books

1. Construction Materials Laboratory Manual, Anna University, Chennai-600 025.
2. IS 4031 (Part 1) – 1996 – Indian Standard Method for determination of fineness by drysieving.
3. IS 2386 (Part 1 to Part 6) – 1963 – Indian Standard methods for test for aggregate for concrete
4. IS 383 – 1970 Indian Standard specification for coarse and fine aggregates from natural sources

Web Resourses

1. https://nptel.ac.in/courses/105102088/
2. https://nptel.ac.in/courses/105106053/
3. https://nptel.ac.in/courses/105104030/

21MA4001	APTITUDE – I	L	T	P	C
		1	0	0	1

Prerequisites for the course

- Basic Mathematics

Objectives

1. Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
2. Students will be able to reason, model, and draw conclusions or make decisions with mathematical, statistical, and quantitative information.

UNIT I	MODULE I	3
Number system, Number series, HCF and LCM of Numbers, Factors and Decimals.		
UNIT II	**MODULE II**	**3**
Square roots and cube roots, Indices and surds, Simplification and approximation, Problems on ages and numbers.		
UNIT III	**MODULE III**	**3**
Percentage, Profit, loss and discount, Average, Ratio and Proportion.		
UNIT IV	**MODULE IV**	**3**
Partnership and share, Alligation and mixtures, Time, work and wages.		
UNIT V	**MODULE V**	**3**
Pipes and cisterns, simple interest, Compound interest, Growth and depreciation.		
	Total Periods	**15**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive Questions 2. Formative Multiple Choice Questions	1.Assignment 2. Online Quizzes 3.Problem-Solving Activities	1. Descriptive Questions 2. Formative Multiple Choice Questions

Outcomes

Upon completion of the course, the students will be able to:

CO1: Solve real-life problems requiring interpretation and comparison of complex numeric summaries which extend beyond simple measures of center.
CO2: Solve real-life problems requiring interpretation and comparison of various representations of ratios
CO3: Distinguish between proportional and nonproportional situations and, when appropriate, apply proportional reasoning.
CO4: Develop an answer to an open-ended question requiring analysis and synthesis of multiple calculations, data summaries, and/or models.
CO5: justify and communicate their conclusions in ways appropriate to the audience.

Text Books

1. Quantitative Aptitude for Competitive Examinations | 7th Edition (Paperback, AbhijitGuha)

Reference Books

4. https://myupsc.com/wp-content/uploads/2020/11/Quantitative-Aptitude-for-Competitive-Examinations-by-Dinesh-Khattar-z-lib.org_.pdf
5. Quantitative Aptitude for Competitive Examinations - Quantitative Aptitude by rsagrawal with 0 Disc. (English, Paperback, Aggarwal R. S.) Revised, 2021

Web Resources

1. https://pdf.bankexamstoday.com/raman_files/Quant%20Formula.pdf
2. https://ugcportal.com/raman-files/QT-TRICKS.pdf
3. https://www.javatpoint.com/aptitude/quantitative#speed-and-distance
4. https://www.indiabix.com/aptitude/questions-and-answers/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	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
CO 1	2	2	1	1	2				2			3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model exam+ Rubric based (50 marks)	END SEM PRACTICAL EXAM (50 marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		

Create		

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO 11	PO 12	PSO1	PSO 2
1	2		2		1	1	3			2	2			
2				2		3		1	2		1	1		
3	2	2	2	2			2		3	3				
4				2		1	2	2				1		
5	2		3		2		2		2		2			

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10
UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

21GE2M02	ENVIRONMENTAL AND SUSTAINABLE ENGINEERING	L	T	P	C
		2	0	0	0

Preamble

To inculcate knowledge on the environment and all sorts of biotic and abiotic components related to its ecosystem, climate changes and challenges faced due to global warming and the importance of renewable sources of energy. Inspire students to find ways in contributing personally and professionally thereby rectifying environmental and social problems.

Prerequisites for the course

- Basic theoretical concepts of biological science in higher secondary level.
- Basic theoretical concepts of Engineering Chemistry.

Objectives

1. To make the students conversant with the interdisciplinary and holistic nature of the environment.
2. To make the students understand the impacts of environmental degradation and to minimise vulnerability to future disasters.
3. To enrich the students with the significances of natural resources and environment on the quality of life.
4. To have an increased awareness among students to create a quest on issues in areas of sustainability.
5. To have a thorough understanding on the concepts of sustainable habitat.

UNIT I	ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY	7

Environment: Definition, Scope and Importance of environment studies. Ecosystem: Structure and function of an ecosystem - Producers - Consumers – Decomposers- Types – Characteristic features: Forest ecosystem - Desert ecosystem - Pond ecosystem-Ocean ecosystem.

Biodiversity - Value of biodiversity - Hot-spots of biodiversity- Threats to biodiversity - Endangered and Endemic species - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II	ENVIRONMENTAL POLLUTION & DISASTER MANAGEMENT	6

Pollution: Definition - Causes - Effects - Control measures of air pollution - Water pollution: (Sewage water treatment by activated sludge and trickling filter process) - Marine pollution - Noise pollution - Soil pollution - Solid waste management - E-waste management.

Disaster management: Causes - Effects - Control measures of Floods - Earthquake - Cyclone.

Field study of local polluted sites – Urban / Rural / Industrial / Agricultural.

UNIT III	NATURAL RESOURCES	6

Forest resources: Use - Overexploitation - Deforestation - case studies. Water resources: Use - Overutilization of surface and groundwater - Water conservation: Rainwater harvesting- Conflicts over water. Mineral resources: Use - Exploitation -Environmental effects of extracting and using mineral resources - Case studies. Food resources: Effects of Modern Agriculture - Fertilizer-Pesticide problems (Eutrophication, Blue baby syndrome, Biomagnification) - Water logging - Salinity - case studies. Energy resources: Renewable (Solar, Wind) - Non renewable energy sources.

UNIT IV	**SUSTAINABILITY**	**6**

Introduction, Need and concept of sustainability, Social- Environmental and Economic Sustainability Concepts, Sustainable Development, Challenges for Sustainable Development. Environmental legislations in India - Water Act, Air Act.

UNIT V	**SUSTAINABLE HABITAT**	**5**

Basic concepts of sustainable habitat, Environment Impact Assessment (EIA) - Procedures of EIA in India, Green Engineering, Social and technological change, Industrial Processes: Pollution Prevention, Industrial Ecology.

	Total Periods	**30**

Suggestive Assessment Methods

Continuous Assessment Test (100 Marks)	**Formative Assessment Test**	**End Semester Exams**
1.Descriptive type questions 2.Formative multiple choice questions		

Outcomes

Upon completion of the course, the students will be able to:

CO1:acquire knowledge on the interdisciplinary and holistic nature of the environment. (Remember)

CO2:analyse the problems related to environmental degradation. (Analyse)

CO3:understand the significance of natural resources on the quality oflife.(Understand)

CO4:identify the issues in areas of sustainability. (Remember)

CO5:acquire knowledge on the concepts of sustainable habitat. (Remember)

Text Books

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
3. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, PrenticeHall.
4. 4. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.

Reference Books

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. ErachBharucha, "Textbook of Environmental Studies", Universities Press (I) Pvt, Ltd, Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.
5. Nibin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-HillProfessional.

Web Resources

1. https://en.wikipedia.org/wiki/Sustainability
2. https://www.greenfacts.org/en/biodiversity/l-3/1-define-biodiversity.htm
3. https://www.nrdc.org/stories/air-pollution-everything-you-need-know

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1				2	3					2		
2	3	2				2	3					2		
3	3		1	1		2	3					2		
4	3	2	1	1		2	3					2		
5	3	2	1	1		2	3					2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	10	10			
UNDERSTAND	50	50			
APPLY	40	40			

ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Students will be able to acquire knowledge on the interdisciplinary and holistic nature of the environment. (Remember)

1. Describe the Multidisciplinary nature of Tirunelveli District.
2. Demonstrate the regulation of Ecosystem

COURSE OUTCOME 2: Students will be able to analyse the problems related to environmental degradation. (Analyse)

1. Demonstrate the control measures of Air and water Pollution
2. Account the problem and suitable remedial measures for floods in the rainy season.

COURSE OUTCOME 3: Students will be able tounderstand the significance of natural resources on the quality of life. (Understand)

1. Highlight the control and effects of deforestation.
2. Describe the role of individual conservation of natural resources

COURSE OUTCOME 4: Students will be able toidentify the issues in areas of sustainability.

(Remember)

1. Outline the term of sustainable development
2. Compare the major limitation of the Air act, 1972 and Water act,1980.

COURSE OUTCOME 5: Students will be able toacquire knowledge on the concepts of sustainable habitat. (Remember)

1. Describe the concept and procedure for Environment Impact Assessment.
2. Explain the prevention for pollution from various industry.

SEMESTER V

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CE5601	Structural Analysis –I	PC	3	3	0	0	3
2	21CE5602	Design of Reinforced Concrete Elements	PC	4	3	1	0	4
3	21CE5603	Foundation Engineering	PC	3	3	0	0	3
4	21CE5604	Water Supply and Waste water Engineering	PC	3	3	0	0	3
5		Professional Elective I	PE	3	3	0	0	3
6		Open Elective I	OE	3	3	0	0	3
Practical Courses								
1	21CE5611	Water Supply and Waste Water Engineering Laboratory	PC	4	0	0	4	2
2	21CE5612	Soil Mechanics Laboratory	PC	4	0	0	4	2
Employability Enhancement Course								
1	21GE5901	Soft skill - Reasoning	EEC	2	0	0	2	1
			Total	**28**	**18**	**0**	**10**	**24**

21CE5601	**STRUCTURAL ANALYSIS I**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisites for the course

- Strength of Materials - II

Objectives

1. To introduce the students to basic theory and concepts of structural analysis and the classical methods for the analysis of buildings.

UNIT I	**INDETERMINATEFRAMES**	**9**

Degree of static and kinematic indeterminacies for plane frames - analysis of indeterminate pin-jointedframes - analysis of indeterminate rigid frames (Degree of indeterminacy up to two)- Determinate and Indeterminate structures.

UNIT II	**INFLUENCELINE**	**9**

Influence line - Influence lines for reactions in statically determinate structures-Influence lines for bending moment and shear force in beam sections , Muller Breslau's – principle.

UNIT III	**ARCHES AND CABLES**	**9**

Arches as structural forms – Types of arches – Analysis of three hinged, two hinged, parabolic and circular arches–fixed arches - Settlement and temperature effects. Equation of the cable subjected to uniformly distributed load, Horizontal tension in the cable, Tension in the cable supported at

different levels - Length of the cable - Effect of change in temperature.

UNIT IV	**SLOPEDEFLECTIONMETHOD**	**9**

Slope deflection method - analysis of continuous beams and portal frames (with and without sway) –bending moment and shear force diagram.

UNIT V	**MOMENTDISTRIBUTIONMETHOD**	**9**

Moment distribution method-Distribution and carryover of moments – Stiffness and carryover factors – analysis of continuous beams and portal frames (with and without sway) – bending moment and shear force diagram.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Analysis the trusses and frames.
CO2: Draw the influence lines for statically determinate and indeterminate structures.
CO3: Analyze and solve two hinged and three hinged arch.
CO4: Analysis of continuous beams and portal frames by Slope Deflection Method
CO5: Analysis of continuous beams and portal frames by Moment distribution method

Text Books

1. Vaidyanathan, R and Perumal, P., -Comprehensive Structural Analysis**||**VolumeIandII,Laxmi PublicationsPvt. Ltd., Chennai, Fourth edition 2008.
2. Subrata Chakarabarty,Sujit KumarRoy.,-Fundamentals of Structural Analysis**||**, S.Chand& CompanyLtd, New Delhi, 2012.
3. S.S.Bhavikatti, -Structural Analysis**||** – Vol.I&II,VikasPublishingPvtLtd., NewDelhi, Fourth Edition 2013.

Reference Books

1.Punmia,B.C.,AshokKumarJain,ArunKumarJain.,—TheoryofStructures||,Laxmi Publications,NewDelhi,2015.
1. Wang, C.K., -AnalysisofIndeterminateStructures**||**, Tata McGraw-Hill, NewDelhi, 2000.
2. Negi,L.S. and Jangid,R.S., -Structural Analysis**||**, Tata McGraw-HillPublications, NewDelhi, 2004.

Web Resources

1. https://onlinelibrary.wiley.com/doi/book/10.1002/9781119544265.
2. http://www.iste.co.uk/book.php?id=1367.

3. https://nptel.ac.in/courses/105105166/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	2									2	
2	3	2	2	2									2	
3	3	2	2	2									2	
4	3	2	2	2									2	
5	3	2	2	2									2	

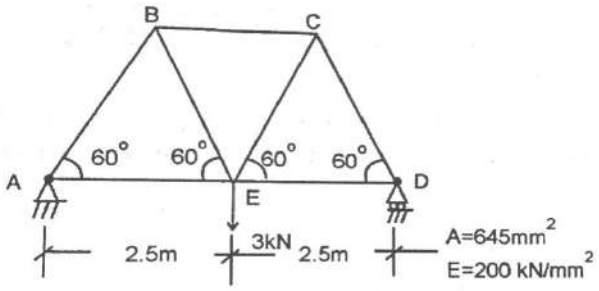
BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	10	10	10	10	10
Apply					
Analyze	80	80	80	80	80
Evaluate					
Create					

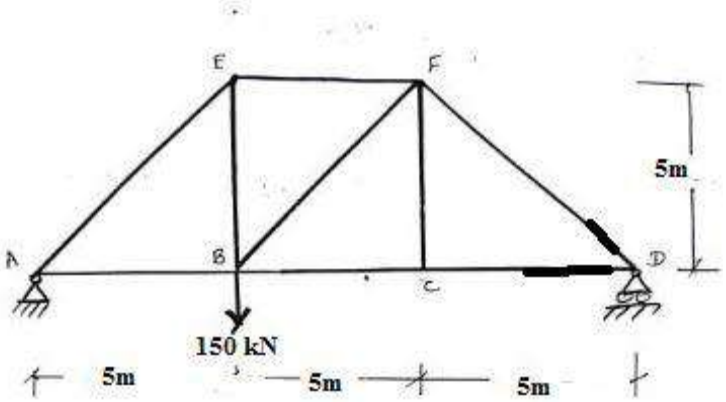
COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Determine the vertical deflection of joint E for the Warren truss shown in Fig



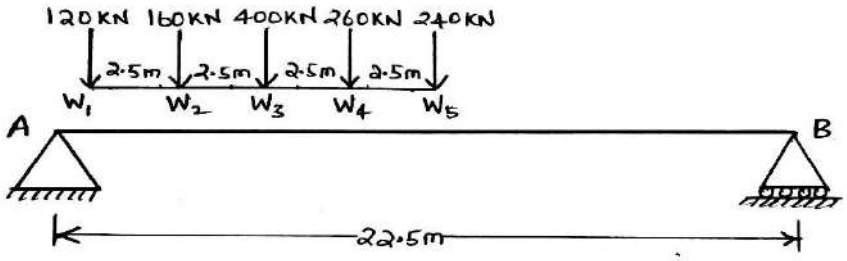
2. A Steel truss of span 15m is loaded as shown in figure 1. The cross sectional area of each member is such that it is subjected to a stress of 100 N/mm^2. Find the vertical deflection of the joint C. Take E = 200 N/mm^2 (Unit load method)



COURSE OUTCOME 2:

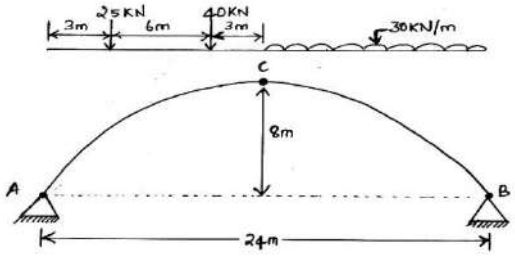
1.Two point loads of 100 kN and 200 kN spaced 3 m apart cross a girder of span 12 m from left to right with the 100 kN leading. Draw the ILD for shear force and bending moment and find the values of maximum shear force and bending moment at a section 4 m from the left hand support. Also evaluate the absolute maximum bending moment due to the given loading system.

2.A train of 5-wheel loads crosses a simply supported beam of span 22.5m as shown in figure. Using influence lines, calculate the maximum positive and negative shear forces at mid span and absolute maximum bending moment anywhere in the span.



COURSE OUTCOME 3:

1. A parabolic 3-Hinged arch carries loads as shown in figure 3.5. Determine the resultant reactions at supports. Find the Bending moment, Normal Thrust and Radial shear at D, 6m from A. What is the maximum bending moment? Also find the change in rise due to an increase in temperature of 20°C if α = 12 x 10^{-6}/°C.

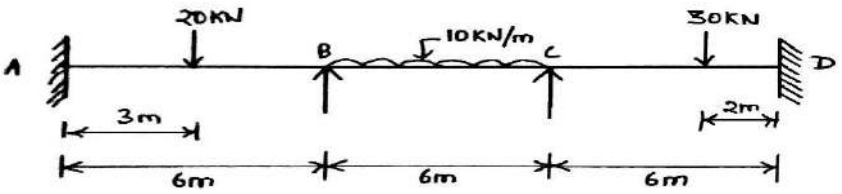


2. A symmetrical three hinged circular arch has a span of 13 m and a rise to the central hinge of 3m. It carries a vertical load of 15 kN at 3m from the left hand end. Find

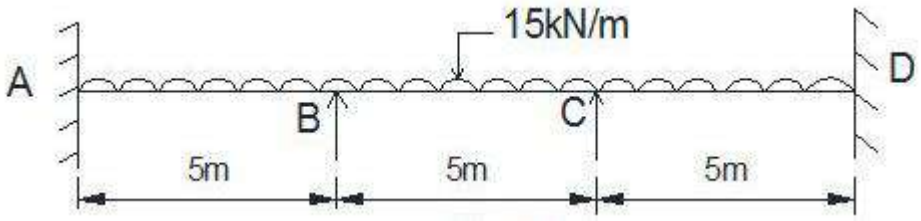
(i) Magnitude of the thrust at the springing
(ii) Bending moment at 5 m from the left hand hinges and radial shear, normal thrust at 7 m from left.
(iii) The maximum positive and negative bending moment.
The reactions at the supports

COURSE OUTCOME 4:

1. Analyze the beam as shown in Figure by Slope-Deflection method and Draw the Bending Moment Diagram and Shear Force Diagram. Assume EI is constant.

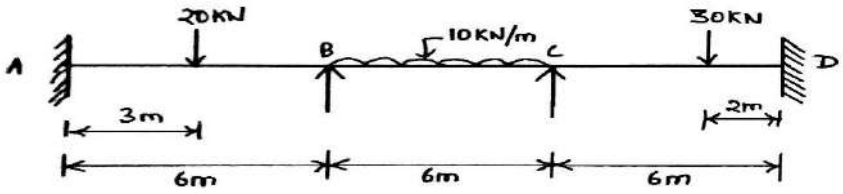


2. Analyze the beam as shown in Figure by Slope-Deflection method and Draw the Bending Moment Diagram and Shear Force Diagram. Assume EI is constant.

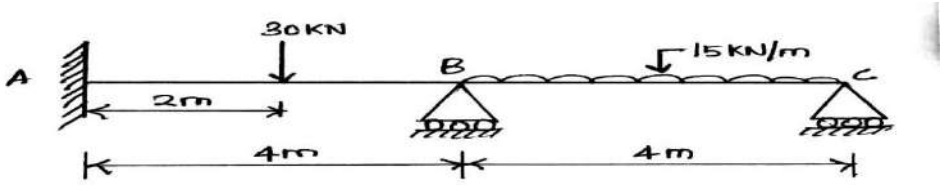


COURSE OUTCOME 5:

1. Analyze the beam shown in figure using moment distribution method. Take EI = constant



2. Analyze the beam shown in figure using moment distribution method. Take EI = constant



21CE5602	DESIGN OF REINFORCED CONCRETE ELEMENTS	L	T	P	C
		3	1	0	4

Prerequisites for the course

- Concrete Technology
- Structural Analysis

Objectives

1. To understand the design philosophies of various methods used for the design of RC structures and to know the design concepts of beam members by working stress method and limit state method.
2. To understand the design of all types of beams, slabs for different boundary conditions as per IS 456-2000.
3. To know the design procedure for beams subjected to bending, shear and torsion as per limit state method.
4. To understand the design of columns at different location as per the IS Code and SP 16
5. To know the design concepts for isolated and combined footings subjected to axial and eccentric loading.

UNIT I	DESIGN FOR FLEXURE	9+3

Concept of Elastic method, ultimate load method and limit state method– Limit State philosophy as detailed in IS code –Design of singly, doubly reinforced rectangular and flanged beams (T – Beams only) - Design of one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions.

UNIT II	DESIGN OF COLUMNS	9+3

Types of columns – Braced and unbraced columns – Design of Rectangular and circular columns for axial, uniaxial and biaxial bending.

UNIT III	DESIGN OF FOOTING	9+3

Design of wall footing – Design of axially and eccentrically loaded rectangular pad and sloped footings – Design of combined rectangular footing for two columns only.

UNIT IV	DESIGN FOR BOND, ANCHORAGE SHEAR & TORSION	9+3

Behavior of RC members in bond and Anchorage - Design requirements as per current code - Behavior of RC beams in shear and torsion - Design of RC members for combined bending shear and torsion.

UNIT V	DESIGN OF WATER TANK AND STAIR CASE	9+3

Design principles of elevated overhead water tank - Design of rectangular underground water tank – Design of circular overhead water tank - Design of staircases – Dog legged – Open Well Stair Case.

Total Periods	45+15

Suggestive Assessment Methods		
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Identify the basic concepts and methods in the design of reinforced concrete structures.

CO2: Design flexural members using limit state method under different loading and end conditions.

CO3: Design flexural members of any cross-sectional shape for shear, bond, and torsion.

CO4: Design RC columns of any cross section with different end conditions

CO5: Select and design RC footing of different cross section under various site conditions.

Text Books

1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
2. Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
3. Subramanian,N.,"Design of Reinforced Concrete Structures",Oxford University Press, New Delhi, 2013.
4. Krishnaraju.N "Design of Reinforced Concrete Structures ", CBS Publishers & Distributors Pvt. Ltd., New Delhi.
5. Dr.Ramachandra, " Limit state Design of Concrete Structures " Standard Book House, New Delhi

Reference Books

1. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998.
2. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002 .
3. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2009.
4. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete",Laxmi Publication Pvt. Ltd., New Delhi, 2007.
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, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999.
8. Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", Structures Publilcations, Pune, 2013.

Web Resources

1. https://www.biblio.com/design-of-reinforced-concrete-by-subramanian-n/work/3413881.
2. https://easyengineering.net/reinforced-concrete-design-books/
3. https://nptel.ac.in/courses/105105105/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1	-	-	-	-				-	2	2	
2	3	3	1	-	-	-	-				-	2	2	
3	3	3	1	-	-	-	-				-	2	2	
4	3	3	1	-	-	-	-				-	2	2	
5	3	3	1	-	-	-	-				-	2	2	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	10	10	10	10	10
Apply					
Analyze	80	80	80	80	80
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Discuss the limit state philosophy as detailed in IS456:2000
2. List the advantages of limit state method over other methods.

COURSE OUTCOME 2:

1. Design a reinforced concrete beam for a simply supported beam of span 5 m and carrying a superimposed load of 20000 N/m inclusive of self-weight of the beam. Use M 20 grade concrete and HYSD of Fe415. Take width of the beam is 300 mm. Adopt limit state method
2. Design a simply supported roof slab by LSM for a room 7.5 m x 3.5 m clear in size. The slab is carrying an imposed load of 5 kN/m^2. Use M20 concrete mix and Fe 415 steel.

COURSE OUTCOME 3:

1. An RCC section 200mmx400mm is subjected to a characteristic torsional moment of 2.5kNm and a transverse shear of 60kN. Assuming the use of M25 grade concrete and Fe 415 HYSD bars. Determine the reinforcements required according to IS456:2000
2. A reinforced concrete beam of rectangular section with a width of 350mm and overall depth of 800mm is subjected to a factored bending moment of 215kNm, ultimate torsional moment of 105kNm and ultimate shear force of 150kN, Using M20 grade concrete and Fe415 HYSD bars and side, top and bottom covers of 50mm , design suitable reinforcement in the section.

COURSE OUTCOME 4:

1. Design a short column of size 500 mm x 600 mm subjected to an axial load, Pu = 2000 kN and biaxial moments Mux = 150 kNm&Muy = 120 kNm by LSM. Use M20 concrete and Fe 415 steel.
2. Design a circular column of diameter 400mm subjected to a load of 1200 kN. The column is having spiral ties. The column is 3 m long and is effectively held in position at both ends but not restrained against rotation. Use M25 concrete and Fe 415 steel.

COURSE OUTCOME 5:

2. A brick masonry wall 230 mm thick carries a load of 370 kN/m inclusive of its own weight. Design the footing of the wall, take bearing capacity of soil as 150 kN/m^2 at 1 m depth. Use M20 concrete and Fe 415 steel.
3. Design a rectangular isolated footing of uniform thickness for an axially loaded column of size 300 mm x 600 mm, load on column is 1150 kN. Safe bearing capacity of the soil is 200 kN/m^2. Use M20 concrete and Fe 415 Steel. Adopt limit state method of design

21CE5603	FOUNDATION ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Engineering Geology
- Soil Mechanics

Objectives

1. To impart knowledge on planning and executing a detail site investigation programme.
2. To proportion different types of shallow footings.
3. To design pile foundation and also calculate the settlement of pile group.
4. To analyze the stability of retaining walls using different methods.

UNIT I	SITE INVESTIGATION AND SELECTION OF FOUNDATION	9

Scope and objectives – 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),Plate load test – Data interpretation - Strength parameters - Bore log report and Selection of foundation.

UNIT II	SHALLOW FOUNDATION	9

Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Factors affecting bearing capacity– Allowable bearing pressure. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements –Methods of minimizing total and differential settlements.

UNIT III	FOOTINGS AND RAFTS	9

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

UNIT IV	PILE FOUNDATION	9

Types of piles and their classification – Load carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Uplift capacity – Group capacity by differentmethods (Feld's rule, Converse – Labarra formula and block failure criterion) – Settlement of pilegroups, Under reamed piles.

UNIT V	RETAINING WALLS	9

Earth pressure theory – Plastic equilibrium in soils – Active and passive states – Rankine's theory– Coulomb's wedge theory – Earth pressure on retaining walls of simple configurations – Stability of retaining wall – Culmann's graphical method for determining earth pressure.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1:Predict the site investigation methods and sampling the soil for testing.
CO2: Evaluate the bearing capacity, settlement of shallow foundation
CO3: Design the footing and raft with respect to soil type.
CO4:Determine the load carrying capacity and settlement of pile foundation.
CO5:Determine the earth pressure on retaining walls and analysis for stability.

Text Books

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

Reference Books

1. Braja M Das, ―Principles of Foundation Engineering‖ (Eigth edition), Cengage Learning 2014.
2. Kaniraj, S.R. ―Design aids in Soil Mechanics and Foundation Engineering‖, Tata McGraw Hill
3. publishing company Ltd., New Delhi, 2014.
4. Joseph E bowles, ―Foundation Analysis and design‖, McGraw Hill Education, 5th Edition, 28th
5. August 2015.
6. IS Code 6403 : 1981 (Reaffirmed 1997) ―Bearing capacity of shallow foundation‖, Bureau of
7. Indian Standards, New Delhi.
8. IS Code 8009 (Part 1):1976 (Reaffirmed 1998) ―Shallow foundations subjected to symmetrical static vertical loads‖, Bureau of Indian Standards, New Delhi.
9. IS Code 8009 (Part 2):1980 (Reaffirmed 1995) ―Deep foundations subjected to symmetrical
10. static vertical loading‖, Bureau of Indian Standards, New Delhi.
11. IS Code 2911 (Part 1): 1979 (Reaffirmed 1997) ―Concrete Piles‖ Bureau of Indian Standards,
12. New Delhi.
13. IS Code 2911 (Part 2): 1979 (Reaffirmed 1997) ―Timber Piles‖, Bureau of Indian Standards, New Delhi.
14. IS Code 2911 (Part 3) : 1979 (Reaffirmed 1997) ―Under Reamed Piles‖, Bureau of Indian
15. Standards, New Delhi.
16. IS Code 2911 (Part 4) : 1979 (Reaffirmed 1997) ―Load Test on Piles‖, Bureau of Indian
17. Standards, New Delhi.

18. IS Code 1904: 1986 (Reaffirmed 1995) —Design and Construction of Foundations in Soils||,
19. Bureau of Indian Standards, New Delhi.
20. IS Code 2131: 1981 (Reaffirmed 1997) —Method for Standard Penetration test for Soils||,
21. Bureau of Indian Standards, New Delhi.
22. IS Code 2132: 1986 (Reaffirmed 1997) —Code of Practice for thin – walled tube sampling for soils||, Bureau of Indian Standards, New Delhi.
23. IS Code 1892 (1979): Code of Practice for subsurface Investigation for Foundations. Bureau of Indian Standards, New Delhi.
24. IS Code 14458 (Part 1) : 1998 —Retaining Wall for Hill Area – Guidelines, Selection of Type of
25. Wall|| , Bureau of Indian Standards, New Delhi.
26. IS Code 14458 (Part 2) : 1998 —Retaining Wall for Hill Area – Guidelines, Design of Retaining/Breast Walls|| , Bureau of Indian Standards, New Delhi.
27. IS Code 14458 (Part 3) : 1998 —Retaining Wall for Hill Area – Guidelines, Construction Of Dry

Stone Walls|| , Bureau of Indian Standards, New Delhi.

Web Resources

1. https://nptel.ac.in/courses/105/101/105101083/
2. https://nptel.ac.in/content/storage2/courses/105105104/pdf/m11l28.pdf

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1	-	2	1	-	-	-	-	-	-	1	2	
2	1	1	-	1	1	-	-	-	-	-	-	1	2	
3	-	-	2	2	-	-	-	-	-	-	-	1	2	
4	1	-	-	1	1	-	-	-	-	-	-	1	2	
5	1	-	-	2	1	-	-	-	-	-	-	1	2	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	30	30	30	30	30
Apply	50	50	50	50	50
Analyze					

Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Describe with neat sketch different types of drilling adopted in soil exploration works.
2. Explain static cone penetration test in detail.

COURSE OUTCOME 2:

1. Explain Terzaghi's bearing capacity theory.
2. Determine the allowable gross load and net allowable load for a circular footing of diameter 2m and with a depth of foundation 1m. Use Terzaghi's theory. Assume local shear failure ϕ=25°, C=12 kN/m^2, γ=16.8 kN/m^3 and factor of safety as 2.8

COURSE OUTCOME 3:

1. Column loads on column A and B are 1920 kN and 2500 kN respectively. Column B is a boundary column. Proportion a trapezoidal footing. The allowable soil pressure is 200kPa.
2. Proportion a strap footing for the following data. Allowable soil pressure and DL + reduced LL is 180 kN/m. For DL & LL is 270 kN/m.

Column	**DL**	**LL**
A	500 kN	400 kN
B	660 kN	840 kN

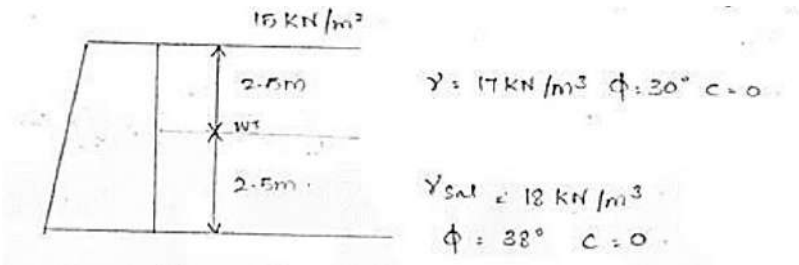
The centre to centre distance between the column is 5m. projections beyond the column A, not to exceed 0.5m

COURSE OUTCOME 4:

1. Explain with neat sketch about pile load test method of determination of load carrying capacity of piles.
2. A concrete pile of diameter 40cm is to be driven in a stiff clay. Unconfined compressive strength of clay is 180 kN/m^2. What is the length required to be penetrated by the pile to support a safe working load of 350 kN. Take adhesion factor as 0.7.

COURSE OUTCOME 5:

1. Explain with neat sketch the culmann's method of calculating active earth pressure.
2. For the retaining wall shown below, draw the earth pressure diagram, for the active case and find the total active earth pressure. Per unit length of the wall and point of application from the base of the wall γ_m= 10kN/m^3



21CE5604	WATER SUPPLY AND WASTE WATER ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Engineering Chemistry

Objectives

1. To enable the students to understand the sources and characteristics of water and wastewater.
2. To enable the students to realize the different water treatment techniques.
3. To recognize the different primary and secondary treatment techniques of wastewater.
4. To learn the principles of sludge management and disposal of wastewater.

UNIT I	SOURCES AND CHARACTERISTICS OF WATER	9

Public Water supply system – Planning, Objectives, Design period, Population forecasting - water demand – Sources of water – Surface and Ground water – Characteristics of water – Water quality Standards.

UNIT II	WATER TREATMENT	9

Water treatment Objectives – Unit operations and processes in surface water treatment – Principles, functions and design of flash mixers, flocculators, sedimentation tanks and Pressure filter – Aeration – iron and manganese removal - defluoridation.

UNIT III	PRIMARY WASTE WATER TREATMENT*	9

Characteristics of sewage, Primary treatment: Principles, functions and design of screen, grit chambers and primary sedimentation tanks.

UNIT IV	SECONDARY WASTE WATER TREATMENT	9

Activated Sludge Process and Trickling filter (no design); Oxidation ditches, UASB - Waste Stabilization Ponds - Anaerobic Stabilization units (no design); Septic tanks (with design), Advances in sewage treatment.

UNIT V	DISPOSAL OF SEWAGE AND SLUDGE	9

Disposal by Dilution – Self purification of surface water bodies – Oxygen sag curve, Land disposal – Sewage farming - characteristics of Sludge -Thickening – Sludge digestion(no design) – Sludge disposal - Drying beds (no design) – Conditioning and Dewatering.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)

1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Identify the source of water and estimate water demand.
CO2: Apply the water treatment methods and design the components.
CO3: Design the various primary treatment units for wastewater.
CO4: Acquire knowledge about the various secondary treatment units.
CO5: Plan for disposal of sewage and sludge.

Text Books

1. Garg, S.K., "Environmental Engineering", Vol.I and II, Khanna Publishers, New Delhi, 2005.

2. Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2010.

3. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2013.

Reference Books

1. Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2013.

2. Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.

3. George Tchobanoglous, Franklin Louis Burton, H. David Stensel, Metcalf & Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw-Hill Edition, 4th ed., New Delhi, 2009.

***Industrial visit may be arranged to visit waste water treatment plant**

Web Resources

1. https://nptel.ac.in/courses/105/104/105104102/
2. https://nptel.ac.in/courses/105/105/105105178/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	-	3	-	2	3	-	-	-	-	-	2		
2	3	-	3	-	2	3	-	-	-	-	-	-		
3	3	-	3	-	2	3	3	-	-	-	-	2		
4	2	-	-	-	2	-	-	-	-	-	-	-		
5	-	-	2	-	2	-	2	-	-	-	-	2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	30	30	30	30	30
Understand	50	50	50	50	50
Apply	20	20	20	20	20
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain the factors affecting the per capita demand of a town.
2. Enumerate and explain the characteristics of surface water and state the environmental significance.

COURSE OUTCOME 2:

1. Discuss in detail about Iron and Manganese removal.
2. The maximum daily demand at a water purification plant has been estimated as 12 Million Litre/Day. Design the dimension of suitable rectangular and circular sedimentation tank for the raw supplies, assuming a detention period of 6 hours and the velocity of flow 20 cm/min.

COURSE OUTCOME 3:

1. Discuss in detail about the classification of screen and state its applications.
2. A rectangular grit chamber is designed to remove particles with a diameter of 0.2mm, specific gravity of 2.65. Settling velocity for these particles has been found to range from 0.016 to 0.022 m/s depending on their shape factor. A flow through velocity of 0.3 m/s will be maintained by proportioning weir. Determine the channel dimension for a maximum wastewater flow of 10000 m^3/day.

COURSE OUTCOME 4:

1. Explain the basic operation of an activated sludge process with a flow diagram.
2. Design a septic tank for a small colony of 200 with an average daily water supply of 100 litres/head/day.

COURSE OUTCOME 5:

1. Explain in detail about the sewage disposal by land.
2. Discuss in detail about the self purification of natural stream.

21CE5611	WATER AND WASTE WATER ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- Water supply and Waste Water Engineering

Objectives

1. To perform common environmental experiments related to water and waste water quality.
2. To know which tests are appropriate for the given environmental problems.
3. To impart the principles of sampling and preservation of water and wastewater.

S.No	List of Experiments	CO
	LIST OF EXPERIMENTS	
1	Determination of Turbidity, Conductivity and pH	CO1
2	Determination of Hardness	CO1
3	Determination of Alkalinity	CO1
4	Determination of Acidity in water	CO1
5	Determination of Chlorides	CO2
6	Determination of Residual chlorine	CO3
7	Determination of Optimum Coagulant	CO2
8	Determination of Total, Dissolved and Suspended solids	CO2
9	Determination of Available chlorine in bleaching powder	CO3
10	Determination of Dissolved Oxygen and BOD for the given sample	CO4
11	Determination of COD for given sample	CO4
12	Sampling and preservation methods and significance of characterization of water and wastewater	CO5
	Total Periods :60	

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
1. EXPERIMENTS 2. Observation 3. Viva voce	1. EXPERIMENTS 2. Record note 3. Viva voce

Outcomes

Upon completion of the course, the students will be able to:

CO1: Estimate the parameters of the water quality.

CO2: Test the water and wastewater and their different characteristics as per Indian Standards.

CO3: Test bleaching powder and find the disinfectant percentage in chlorinated water.

CO4: Estimate the amount of oxygen required for digestion of organic material.

CO5:Acquire the sampling and preservation methods of water and wastewater.

Text Books

1. Garg, S.K, "Environmental Engineering", Vol I and II, Khanna Publishers, New Delhi, 2005.
2. Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2010.
3. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2013.

Reference Books

1. Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2013.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.
3. George Tchobanoglous, Franklin Louis Burton, H. David Stensel, Metcalf & Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw-Hill Edition, 4th ed., New Delhi, 2009.

Web Resources

1. https://nptel.ac.in/courses/105/104/105104102/
2. https://nptel.ac.in/courses/105/105/105105178/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
1	-	-	3	-	2	-	-	-	2	-	-	2		
2	-	-	3	2	2	-	-	-	2	-	-	2		
3	-	-	2	-	-	2	1	-	2	-	-	2		
4	-	-	-	-	2	-	-	-	2	-	-	2		
5	-	-	-	2	-	-	2	-	2	-	-	2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model exam+ Rubric based (50 marks)	END SEM PRACTICAL EXAM (50 marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Estimate the parameters of the water quality.

1. Determine Hardness of the given water sample.
2. Determine the Alkalinity of the water sample.

COURSE OUTCOME 2: Test the water and wastewater and their different characteristics as per standards.

1. Determine the amount of chlorides in water.
2. Determine the optimum coagulant dosage.

COURSE OUTCOME 3: Test bleaching powder and find the disinfectant percentage in chlorinated water.

1. Determine the amount of Residual chlorine.
2. Determine the available chlorine in bleaching powder.

COURSE OUTCOME 4: Estimate the amount of oxygen required for digestion of organic material.

1. Measure the amount of oxygen required by microorganisms to decompose biodegradable organic matter under aerobic conditions to oxidize present in water and wastewater.
2. Measure the amount of oxygen required to chemically oxidize the organic material and inorganic nutrients.

COURSE OUTCOME 5: Acquire the sampling and preservation methods of water and wastewater.

1. Describe about the sampling methods of water and wastewater.
2. Describe the preservation techniques of water and wastewater.

21CE5612	SOIL MECHANICS LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- Soil Mechanics

Objectives

1. To gain experience regarding the determination of properties of different types of soils
2. To provide an opportunity to learn how to measure the shear strength of the soil and its importance.
3. To impart knowledge about the foundation engineering

S.No	List of Experiments	CO
1	Determination of Moisture Content	CO1
2	Determination of Specific Gravity of soil	CO1
3	Relative Density for sand	CO1
4	Sieve Analysis for Coarse Grained soil	CO1
5	Atterberg‘s Limits	CO2
6	Field Density Test (Core Cutter Method & Sand replacement method)	CO5
7	Compaction test (Standard Proctor‘s Test)	CO4
8	Permeability Test	C02
9	Unconfined Compression Test for Cohesive Soil	CO3
10	Direct Shear Test on Sand	CO3
11	Demonstration on Triaxial Compression Test	CO3
12	Demonstration on One dimensional Consolidation Test	CO4

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
50	50

Outcomes

Upon completion of the course, the students will be able to:	
CO1	Determine the index properties of the soil
CO2	Apply the knowledge of science and techniques in engineering properties of soil.
CO3	To identify shear strength parameters of soil
CO4	Identify the suitability of the soil for different foundations
CO5	Evaluate the impact of field density of soil.

Laboratory Requirements

1. Pycnometer
2. Sieve test
3. Hydrometer
4. Proctor Compaction mould
5. Sand replacement equipment
6. Casagrande apparatus
7. Direct Shear apparatus
8. Tri-axial apparatus
9. Vane shear test
10. Permeability test apparatus
11. Oven
12. Unconfined Compressive strength apparatus
13. Three gang consolidation

Reference Books

1. Lambe T.W., —Soil Testing for Engineers", John Wiley and Sons, New York, 1990.
2. Saibaba reddy, E.Ramasastri, K. Measurement of engineering properties of Soil. New age International (p) Limited publishers, New Delhi, 2002.

Web Resources

1. https://nptel.ac.in/courses/105101160

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3									3		
2	3	3	3	3	3		3		2	3		3		
3	2	3		2	3					3		3		
4			3		2		1		1	3		3		
5	2	3		2						3		3		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Determine the natural moisture content of the given soil sample.
2. Determine the Relative Density for soil sample

COURSE OUTCOME 2:

1. Determine the liquid limit of the given soil sample by using casagrande type mechanical liquid limit apparatus.

2 . Determine the coefficient of permeability of soil by constant head method.

COURSE OUTCOME 3:

1. Find the shear strength of soil by tri-axial test.
2. Determine the shear strength of soil with a particle size of 4.75mm by direct shear test.

COURSE OUTCOME 4:

1. Determine the maximum dry density of given soil sample using standard proctor test

2. Determine the settlement due to primary consolidation of soil by conducting one dimensional test

COURSE OUTCOME 5:

1. Determine the insitu dry density of given soil by sand replacement method.
2. Determine the field density of soil using core cutter method.

21GE5901	SOFT SKILL - REASONING	L	T	P	C
		1	0	0	1

Prerequisites for the course

- Verbal Ability

Objectives

1. To strengthen the social network by the effective use of social media and social interactions.
2. To identify own true potential and build a very good personal branding
3. To develop critical thinking to solve real world problems and competitive exam problems for students

UNIT I	Social Media	3

Effective use of social media - Types of social media, Moderating personal information, Social media for job/profession, Communicating diplomatically.

Networking on social media - Maximizing network with social media, How to advertise on social media.

UNIT II	Social Interaction	3

Event management - Event management methods, Effective techniques for better event management

Influencing - How to win friends and influence people, Building relationships, Persistence and resilience, Tools for talking when stakes are high

Conflict resolution - Definition and strategies ,Styles of conflict resolution

UNIT III	Non Verbal Communication	3

Proximecs - Types of proximecs, Rapport building. Reports and Data Transcoding - Types of reports. Negotiation Skill - Effective negotiation strategies. Conflict Resolution - Types of conflicts.

UNIT IV	Interpersonal Skill	3

Social Interaction - Interpersonal Communication, Peer Communication, Bonding, Types of social interaction. Responsibility - Types of responsibilities, Moral and personal responsibilities. Networking - Competition, Collaboration, Content sharing. Personal Branding - Image Building, Grooming, Using social media for branding. Delegation and compliance - Assignment and responsibility, Grant of authority, Creation of accountability

UNIT V	Reasoning Ability	3

Analytical Reasoning Data Arrangement(Linear and circular & Cross Variable Relationship), Blood Relations, Ordering/ranking/grouping, Puzzle test, Selection Decision table

Total Periods	15

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive questions 2. Formative multiple choice questions	1.assignment 2. Online quizzes 3.problem-solving activities	1. Descriptive questions 2. Formative multiple choice questions

Outcomes

Upon completion of the course, the students will be able to:

CO1: Understanding the various strategies of conflict resolution among peers and supervisors and respond appropriately

CO2: Acquire wide knowledge on social interaction

CO3: Improve speaking skills in academic and social contexts

CO4: Improve interpersonal communication through proper pronunciation.

CO5: Interpret the analytic reasoning ability which would help them in their professional career.

Text Books

1. ETHNUS, Aptimithra, 2013, First Edition, McGraw-Hill Education Pvt.Ltd.
2. Mark G. Frank, David Matsumoto, Hyi Sung Hwang, Nonverbal Communication: Science and Applications, 2012, 1 st Edition, Sage Publications, New York.

Reference Books

6. Kerry Patterson, Joseph Grenny, Ron McMillan, Al Switzler, Crucial Conversations: Tools for Talking When Stakes are High, 2001,1st edition McGraw Hill Contemporary, Bangalore.
7. Dale Carnegie, How to Win Friends and Influence People, Latest Edition,2016. Gallery Books, New York

Web Resources

5. https://www.fresherslive.com/online-test/logical-reasoning-test/questions-and-answers
6. https://www.indiabix.com/non-verbal-reasoning/questions-and-answers/
7. https://www.indiabix.com/logical-reasoning/questions-and-answers/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO 9**	**PO1 0**	**PO 11**	**PO 12**	**PSO1**	**PS O2**
1	1	2	2										2	2
2		2		2		2			1		3		1	2
3	1			1	1		2			1	2	2		

4	1	2	2		3			3	2				2	1
5	2		2	2		2			2		1		2	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**FAT 1**	**FAT 2**	**END SEM EXAM**
Remember	20	10	5	5	10
Understand	40	20	10	10	20
Apply	40	50	5	5	50
Analyze		20	5	5	20
Evaluate					
Create					

SEMESTER VI

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21CE6601	Design of Steel Structures	PC	4	3	1	0	4
2	21CE6602	Structural Analysis-II	PC	3	3	0	0	3
3		Professional Elective II	PE	3	3	0	0	3
4		Professional Elective III	PE	3	3	0	0	3
5		Professional Elective IV	PE	3	3	0	0	3
6		Open Elective II	OE	3	3	0	0	3
Practical Courses								
1	21CE6611	Structural Analysis and Design laboratory	PC	4	0	0	4	2
Employability Enhancement Course								
1	21CE6912	Survey camp*	EEC	4	0	0	2	1
2	21PT3901	Aptitude II	EEC	2	0	0	2	1
* Two weeks during FIFTH semester vacation								
			Total	**29**	**18**	**1**	**8**	**23**

21CE6601	**DESIGN OF STEEL STRUCTURES**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

Prerequisites for the course

- Strength of materials
- Structural Analysis I

Objectives

- To gain knowledge on the design of welded, riveted and bolted joints used in steel connections.
- Toimpartknowledgeonthedesignconceptsofvariousstelstructuralelementslikecompressionmembers, tension members, flexural member's and design of trusses members.

UNIT I	**DESIGN METHODS AND CONNECTIONS FOR STEEL MEMBERS**	**9+3**

Properties of steel–Structural steel sections–Limit State Design Concepts–Loads on Structures–Connections using rivets, welding, bolting–Design of bolted and welded joints–Eccentric connections–Efficiency of joints.

UNIT II	**STEEL TENSION MEMBERS**	**9+3**

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

UNIT III	**STEEL COMPRESSION MEMBERS**	**9+3**

Types of compression members and sections–Behavior and types of failures-Short and slender columns- Current code provisions for compression members - Effective Length, Slenderness ratio – 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 IV	STEEL FLEXURE MEMBERS	9+3
Types of steel Beam sections - Behavior of Beams in flexure– 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 Strength of Laterally unsupported Beams.		
UNIT V	**DESIGN OF TRUSSES**	**9+3**
Introduction-Evaluation of design dead load, live load, wind load, design of truss using rolled steel sections-Purlins-Truss members-Supports.		
	Total Periods	**60**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Written Test	MCQ	Written Test

Outcomes

Upon completion of the course, the students will be able to:

CO1 Design the suitable connection for joints in steel structures.
CO2 Design steel tension members using plates and angle sections.
CO3 Design steel compression members like simple columns, built up columns and column bases.
CO4 Design flexural members like beams and plate girders.
CO5 Evaluate the various loads acting and design the trusses and purlins.

Text Books

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.
3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

Reference Books

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002.
2. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.
3. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, IK International Publishing House Pvt. Ltd., 2009.
4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007 Structures Publications, 2009.
5. IS800 :2007, General Construction In Steel – Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 110002.
6. IS 875: 1987 Code Of Practice, for Design Loads For Buildings And Structures, Bureau of Indian Standards, New Delhi, 110002.

Web Resources

1. https://nptel.ac.in/courses/105/105/105105162/
2. https://www.digimat.in/nptel/courses/video/105105162/L01.html
3. https://www.digimat.in/nptel/courses/video/105105162/L28.html

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	2									2	
2	3	2	2	2									2	
3	3	2	2	2									2	
4	3	2	2	2									2	
5	2	2	2	2									2	

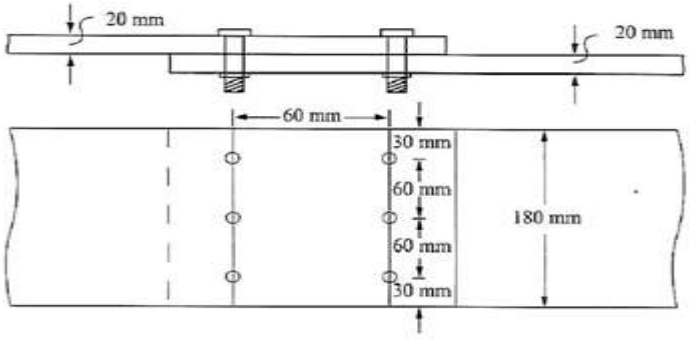
BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	20	20	20	20	20
Apply	70	70	70	70	70
Analyze					
Evaluate					
Create					

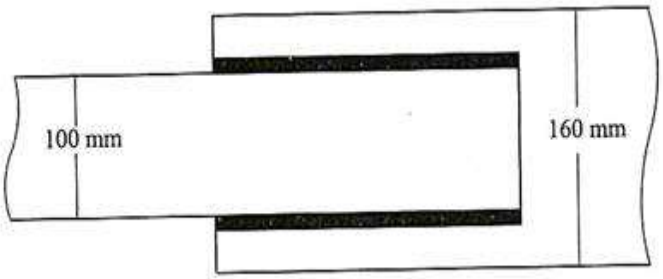
COURSE LEVEL ASSESSMENT QUESTIONS

C COURSE OUTCOME 1:

1. Find the efficiency of the lap joint shown in fig. with the following data: M20 bolts of grade 4.6 and Fe410 plates are used.

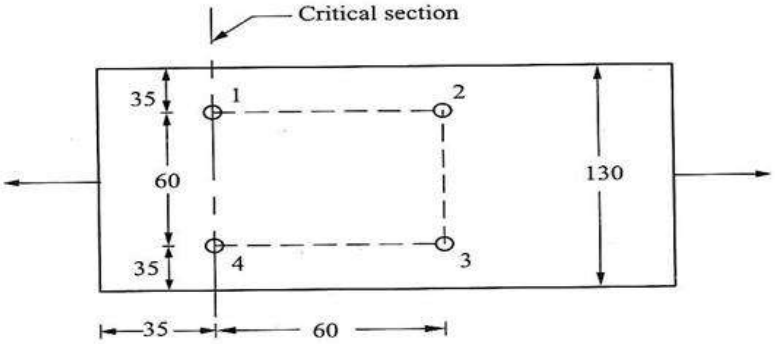


2. Design a suitable longitudinal fillet welds to connect the plates as shown in fig. To transmit a pull equal to the full strength of small plate. Given: plates are 12mm thick, grade of plates Fe410 and welding to be made in workshop.



COURSE OUTCOME 2:

1.Determine the design tensile strength of the plate 200mmx12mm with the holes for 16mm diameter bolts as shown in fig. Steel used is of Fe415 grade quality.



2. A tension member of a roof truss carries a factored axial tension of 430Kn. Design the section and its connection

a) Without using lug angle

b) Using lug angle

COURSE OUTCOME 3:

1. In a truss a strut 3m long consists of two angles ISA 100100, 6mm.find the factored strength of the member if the angles are connected on both sides of 12mm gusset plate by

i) One bolt

ii) Two bolt

iii) Welding, which makes the joint rigid.

2. A upper storey column ISHB 300 @577N/m carries a factored load of 1200 kN and a factored moment of 12 kN-m.it is to be spliced with lower storey column ISHB 400 @806N/m. design a suitable splice.

COURSE OUTCOME 4:

1. A roof of a hall measuring 8mx12m consists of 100mm thick R.C slab supporting on steel I beam spaced 3m apart as shown in fig. The finishing load may be taken as 1.5kN/m^2.design

the steel beam.

3. An ISMB 500 section IA used as a beam over a span of 6 m, with simply supported ends. Determine the maximum factored uniformly distributed load that the beam can carry if the ends are restrained against torsion but compression flange islaterally unsupported.

COURSE OUTCOME 4:

1. Design angle purlin for the following data by simplified Method:
Spacing of trusses=4m
Spacing of purlins=1.6m
Weight of A.C sheets including laps and fixtures=0.205kN/m^2 Live load=0.6 kN/m^2 Wind load=1 kN/m^{20}
Inclination of main rafter of truss=21

2. List out the various elements of the roof truss and mark all its significance.

21CE6602	STRUCTURAL ANALYSIS II	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Structural Analysis I
- Mechanics for Civil Engineering

Objectives

1. To analyze statically indeterminate structures by imposing boundary conditions on flexibility and stiffness matrix.
2. To understand the basics of finite element method and its application to structural analysis.
3. To acquire knowledge on plastic analysis of structures and to calculate the collapse loads for beams and frames.

UNIT I	FLEXIBILITY MATRIX METHOD	9

Concept of flexibility matrix – determinate Vs indeterminate - Analysis of indeterminate pin-jointed plane frames, analysis of continuous beams, rigid jointed plane frames (with redundancy restricted to two).

UNIT II	STIFFNESS MATRIX METHOD	9

Stiffness matrix for beam element - analysis of continuous beams - plane frames & pin jointed plane frames (with redundancy restricted to two).

UNIT III	FINITE ELEMENT METHOD	9

Introduction – Discretization of structure – Displacement functions – Truss element – Beam element –Plane stress and plane strain - Triangular elements.

UNIT IV	PLASTIC ANALYSIS OF STRUCTURES	9

Plastic moment of resistance - shape factor, collapse load - analysis of continuous beams and portal frames – limiting conditions for applications.

UNIT V	SUSPENSION BRIDGES	9

Analysis of Suspension bridges with two and three hinged stiffening girders – Beams curved in plan.

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test	Formative Assessment Test	End Semester Exams
(30 Marks)	**(10 Marks)**	**(60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Analyze continuous beams, pin-jointed indeterminate plane frames and rigid plane frames by flexibility method

CO2: Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames.

CO3: Understand the fundamentals of finite element analysis

CO4: Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames.

CO5: Analyze the suspension bridges with stiffening girders.

Text Books

1. Vaidyanathan, R and Perumal, P. ―Comprehensive Structural Analysis,‖ Volume I and II, Laxmi Publications Pvt. Ltd., Chennai, 4th ed., 2008.
2. V.N.Vazirani & M.M.Ratwani, ―Analysis of Structures‖ Volume I and II, Khanna Publishers, New Delhi, 2015
3. S.S.Bhavikatti, ―Structural Analysis‖ - Vol. I & II, Vikas Publishing Pvt Ltd., New Delhi, 4th ed., 2013.

Reference Books

1.R.L.Jindal, ―Indeterminate Structures‖, Tata McGraw Hill Publishing House, 1996.
2.Negi.L.S, ―Theory & Problems in Structural Analysis‖, Tata McGraw Hill Publishing House, 2002
3.G.S.Pandit & Gupta S.P, Structural Analysis (A Matrix Approach), Tata McGraw Hill, PublishingLtd, 2008.

Web Resources

1. https://nptel.ac.in/courses/105105109

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
1	3	2	2	2									2	
2	3	2	2	2									2	
3	3	2	2	2									2	
4	3	2	2	2									2	
5	2	2	2	2									2	

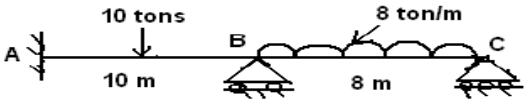
BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	10	10	10	10	10
Apply					
Analyze	80	80	80	80	80
Evaluate					
Create					

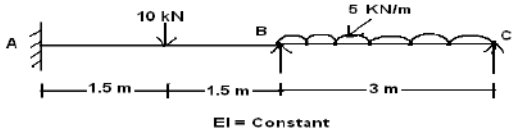
COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Two span continuous beam ABC is fixed at A and simply supported over the supports B and C. AB = 10 m and BC = 8 m. moment of inertia is constant throughout. A single central concentrated load of 10 tons acts on AB and a uniformly distributed load of 8 ton/m acts over BC. Analyse the beam by flexibility matrix method.

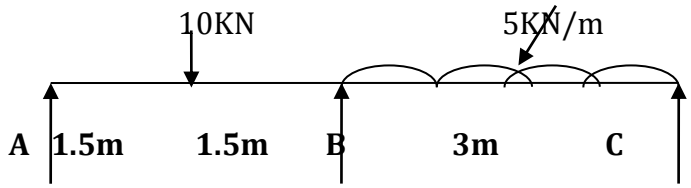


2. Analyse the continuous beam ABC shown in figure by flexibility method and also draw the BMD diagram.

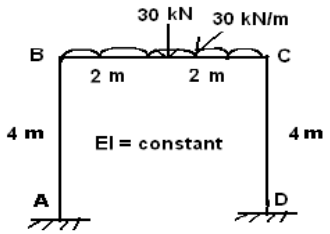


COURSE OUTCOME 2:

1. Analyse the continuous beam ABC shown in figure by Stiffness method and also draw the BMD diagram



2. Analyse the portal frame ABCD shown in figure by stiffness method and also sketch the bending moment diagram.

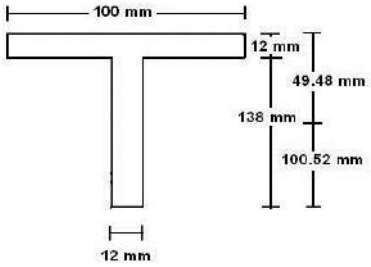


COURSE OUTCOME 3:

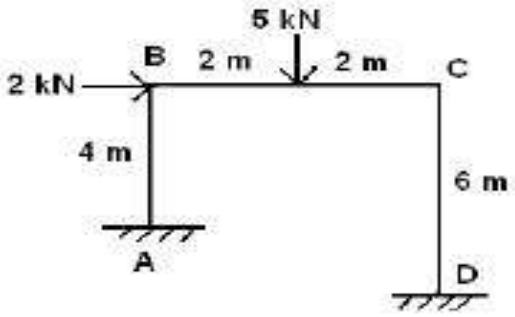
1. Develop the shape functions of eight noded brick element
2. Derive the stiffness matrix for a two noded bar element

COURSE OUTCOME 4:

1. Determine the shape factor of a T-section beam of flange dimension 100 x 12 mm and web dimension 138 x 12 mm thick.



2. Find the fully plastic moment required for the frame shown in figure, if all the members have same value of MP.



COURSE OUTCOME 5:

1. A three hinged stiffening girder of a suspension bridge of 100 m span subjected to two point loads 10 kN each placed at 20 m and 40 m respectively from the left hand hinge. Determine the bending moment and shear force in the girder at section 30 m from each end. Also determine the maximum tension in the cable which has a central dip of 10 m.

2. A quarter circular beam of radius 'R' curved in plan is fixed at A and free at B as shown in figure. It carries a vertical load P at its free end. Determine the deflection at free end and draw the bending moment and torsional moment diagrams. Assume flexural rigidity (EI) = torsional rigidity (GJ).

21CE6611	STRUCTURAL ANALYSIS AND DESIGN LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- Design of Reinforced Concrete Structure
- Design of Steel Structures

Objectives

- To acquire hands on experience in Computer aided analysis and design of concrete / steel structures normally encountered in Civil Engineering practice.

S.No	List of Experiments	CO
1	RCC framed structure analysis (one way, two way Slab, beam and Column system).	CO1
2	RCC framed structure (G+4) under seismic force.	CO2
3	RCC framed structure (G+4) under wind load.	CO2
4	RCC foundation (Isolated and Combined)	CO4
5	Elevated rectangular water Tank.	CO3
6	Elevated circular water Tank.	CO3
7	RCC T beam bridge deck.	CO5
8	Steel Framed Structure	CO6
9	Simple Steel Roof Trusses	CO6
		Total Periods :60

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
1. Experiments 2. Observation 3. Viva voce	1. Experiments 2. Record note 3. Viva voce

Outcomes

Upon completion of the course, the students will be able to:

CO1: Design and analysis of solid slab and RCC structural elements for live and dead loading and reinforcement details

CO2: Design and analysis of RCC framed structure for seismic and wind load.

CO3: Design and analysis of circular and rectangular RCC water tanks

CO4: Design and analysis of isolated and combined footing.

CO5: Design and analysis of RCC T beam bridge deck.

CO6: Design and analysis of steel framed & roof truss

Text Books

1. Krishnaraju,N. "Structural Design & Drawing, Universities Press,2009.
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd.,2003.

Reference Books

1. Krishnamurthy, D., "Structural Design & Drawing – Vol. II and III, CBS Publishers,2010.
2. Shah V L and Veena Gore, "Limit State Design of Steel Structures" IS800-2007, Structures Publications, 2009.

Web Resources

1. https://nptel.ac.in/courses/105/105/105105105/
2. https://nptel.ac.in/courses/105/105/105105162/

21CE6912	SURVEY CAMP	L	T	P	C
		0	0	2	1

Prerequisites for the course

- Surveying
- Surveying Laboratory

Objectives

1. To create a topographical map using Advanced Instruments like total station and GPS.
2. To apply the various applications of leveling such as LS & CS and Contouring.
3. To acquire knowledge about Triangulation methods.

List of Experiments

The objective of the survey camp is to enable the students to get practical training in the field work. The camp must involve work on a large area with different terrain conditions. At the end of the camp, each student should submit a report. The camp record shall include all original field observations, calculations and plots.

2 weeks Survey Camp will be conducted during fifth semester vacation in the following activities:

1. Triangulation surveying
2. Contouring (Radial contouring/Grid Contouring)
3. Longitudinal sectioning & Cross sectioning for the construction of Roads
4. Curve setting by using linear & angular method
5. Determination of Distance, Direction & Elevation using Total station
6. Application of Total station Pre Construction & Construction Surveying
7. Use of Global Positioning System to determine latitude & longitude and mapping using AutoCAD

Suggestive Assessment Methods

Lab Components Assessments (50 Marks)	End Semester Exams (50 Marks)
1. Experiments 2. Observation 3. Vivavoce	1. CampReport 2. Vivavoce

Outcomes

Upon completion of the course, the students will be able to:

CO1 Understand various concepts of surveying and apply it practically

CO2. Create a topographical map using Advanced Instruments like total station and GPS

CO3 Prepare contour map for the given area.

CO4 Understand the concepts of curve setting by linear and angular methods

CO5 Acquire knowledge about various triangulation methods.

Text Books

1. Dr.B.C.Punmia,AshokKumarJain,AshokKr.Jain,ArunKr.Jain,Surveying(Volume–Iand II),LakshmiPublications,17thEdition,2016
2. 2.DuggalSK.,Surveying,Vol-IandII,MCGrawHillEducation(India)PrivateLimited,4th Edition, 2013.

Reference Books

1. BasakNN,Surveying&Levelling,TataMcGraw-HillEducation,2ndEdition,2014
2. Madhu,N,Sathiskumar,RandSatheeshGobi,AdvancedSurveying:TotalStation,GISand RemoteSensing,PearsonIndia,2ndEdition,2017.
3. Manoj,K.AroraandBadjatia,GeomaticsEngineering,NemChand&Bros,2011
4. Bhavikatti,S.S.,SurveyingandLevelling,Vol.IandII,I.K.International,2ndEdition,2016
5. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 4th Edition,2012.
6. SeeberG,SatelliteGeodesy,waterDeGruyter,Berlin1998.

Web Resources

1. https://www.youtube.com/watch?v=W3Up9QD0U08
2. https://www.youtube.com/watch?v=rhon-wYbwDQ
3. https://www.youtube.com/watch?v=WB3_thGjEeU
4. https://www.youtube.com/watch?v=27rgMIWkHY0

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2	2	3				2		2	2	2	
2	3	3	2	2	3				2		2	2	2	2
3	3	3	2	2					2	2	2	2	2	2
4	3	3	2	2	3				2	2	2	2		2
5	3	3	2	2						2	2	2		

21MA6001	APTITUDE - II	L	T	P	C
		1	0	0	1

Prerequisites for the course

- Basic Maths

Objectives

1. Students will be able to critique and evaluate quantitative arguments that utilize mathematical, statistical, and quantitative information.
2. Students will be able to use appropriate technology in a given context.

I	MODULE I	3
Time and distance, Trains, Boats and Streams, Races.		
II	**MODULE II**	**3**
Clocks, Calendar, Area of plane figures, Volume and surface area of solid figures.		
III	**MODULE III**	**3**
Elementary algebra, Linear equations, Quadratic equations and in – equations, Progression.		
IV	**MODULE IV**	**3**
Permutation and combination, Probability, Geometry, Trigonometry.		
V	**MODULE V**	**3**
Data interpretation, Data sufficiency.		
	Total Periods	**15**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)

1. DESCRIPTIVE QUESTIONS **. FORMATIVE MULTIPLE CHOICE QUESTIONS**	**1.ASSIGNMENT** **2. ONLINE QUIZZES** **3.PROBLEM-SOLVING ACTIVITIES**	**1. DESCRIPTIVE QUESTIONS** **2. FORMATIVE MULTIPLE CHOICE QUESTIONS**

)utcomes

Upon completion of the course, the students will be able to:

- **CO1:**Distinguish between proportional and nonproportional situations and, when appropriate, apply proportional reasoning.
- **CO2:**Analyze and critique mathematical models and be able to describe their limitations.
- **CO3:**Analyze and critique mathematical equations and be able to describe their limitations.
- **CO4:**Evaluate claims based on empirical, theoretical, and subjective probabilities.
- **CO5:**Create and use visual displays of data.

Books

Quantitative Aptitude for Competitive Examinations | 7th Edition (Paperback, AbhijitGuha)

Reference Books

1.https://myupsc.com/wp-content/uploads/2020/11/Quantitative-Aptitude-for-Competitive-Examinations-by-Dinesh-Khattar-z-lib.org .pdf

2. Quantitative Aptitude for Competitive Examinations - Quantitative Aptitude by rs agarwal with 0 Disc. (English, Paperback, Aggarwal R. S.) Revised, 2021

Resources

https://pdf.bankexamstoday.com/raman_files/Quant%20Formula.pdf

https://ugcportal.com/raman-files/QT-TRICKS.pdf

https://www.javatpoint.com/aptitude/quantitative#speed-and-distance

https://www.indiabix.com/aptitude/questions-and-answers/

SEMESTER VII

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	21GE7101	Total Quality Management	HSSM	3	3	0	0	3
2	21CE7701	Estimation and cost analysis	PC	3	3	0	0	3
3		Professional Elective V	PE	3	3	0	0	3
4		Professional Elective VI	PE	3	3	0	0	3
5		Open Elective III	OE	3	3	0	0	3
6		Open Elective IV	OE	3	3	0	0	3
Practical Courses								
1	21CE7911	Innovative Design Project	EEC	4	0	0	6	3
			Total	**22**	**18**	**0**	**6**	**21**

21GE7101	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	**0**	**0**	**3**

Preamble

This course is crucial for engineering students. It promotes excellence, continuous improvement, and collaboration, which strive to integrate technical skills with quality principles, customer satisfaction, and organizational effectiveness. TQM prepares the students for industry challenges.

Prerequisites for the course

Knowledge of quality concepts, communication abilities, and a commitment to continuous learning.

Objectives

1. To understand the need for quality and its evolution over time.
2. To understand the quality principles and its performance.
3. To equip with a thorough understanding of quality management tools and techniques.
4. To enable them to effectively implement these tools and techniques to optimize quality management practices.
5. To understand the standards, and benefits of ISO registration, and provide an overview of ISO related standards.

UNIT I	INTRODUCTION	9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

UNIT II	TQM PRINCIPLES	9

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen.

UNIT III	TQM TOOLS AND TECHNIQUES I	9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV	TQM TOOLS AND TECHNIQUES II	8

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V	QUALITY MANAGEMENT SYSTEM	10

Introduction—How are standards developed? - Benefits of ISO Registration—ISO 9000 Series of Standards - ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration. Environmental Management System:ISO 14000 Series Standards—Concepts of ISO 14001 - Benefits of EMS.ISO 45001 and related standards — Occupational health and safety, ISO/IEC 27000 family — Information security management - ISO 31000 - Risk management - ISO 26000 - Social responsibility - ISO 20121 - Sustainable events

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
WRITTEN TEST	**1.ASSIGNMENT** **2. ONLINE QUIZZES** **3.PROBLEM-SOLVING ACTIVITIES**	**WRITTEN TEST**

Outcomes

Upon completion of the course, the students will be able to:		Blooms Level
1	Understand the need for quality, grasp the concepts of TQM, and apply strategies for customer satisfaction and retention.	Understand
2	Understand the contribution of Quality Gurus in TQM Journey	Understand
3	Examine the traditional tools and equipping with the knowledge and skills to drive quality improvement initiatives effectively.	Analyse
4	Analyse the various Techniques andfoster their ability to enhance quality management practices.	Analyse

5	Examine various Quality Standards, ISO registrations (9000, 14000, 45001, 27000, 31000, 26000, 20121) for quality, safety, and social responsibility.	Analyse

Text Books

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield,MaryB.Sacre,HemantUrdhwareshe and RashmiUrdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.
2. Poornima M., Pearson publication, rd Edition, Total Quality Management 2017

Reference Books

1. SubburajRamasamy, Total Quality Management, Mc Graw Hill Publications
2. Sunil Luthra, Dixit Garg, Ashish Agarwal, Sachin K. Mangla, Total Quality Management (TQM): Principles, Methods, and Applications, Publisher: CRC Press, 2020; ISBN 1000194493,
3. D.R. Kiran, Total Quality Management: Key Concepts and Case Studies, Publisher Butterworth-Heinemann, 2016, ISBN 0128110368,
4. W. Edwards Deming, The Essential Deming: Leadership Principles from the Father of Quality, Editors Joyce Orsini, Diana Deming Cahill, Publisher: McGraw Hill Professional, 2012, ISBN: 0071790217, 9780071790215

Web Recourses

2. http://www.notesengine.com/dept/cse/7sem/anna-university-7-sem-cse-notes.html
3. http://www.vidyarthiplus.com/vp/Thread-GE2022-Total-Quality-Management-Lecture-Notes-Lonely-Edition
4. http://freshupdates.in/lecture-notes/anna-university-total-quality-management-lecture-notes/
5. http://www.iannauniversity.com/2012/06/ge2022-total-quality-management-lecture.html
6. https://www.iso.org/popular-standards.html

21CE7701	ESTIMATION AND COST ANALYSIS	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Estimation Quantity for Cost in Buildings

Objectives

1. To provide the student with the ability to estimate the quantities of item of works
2. The student has the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items.

UNIT I	ESTIMATE OF BUILDINGS	9

Introduction - Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof - Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.

UNIT II	ESTIMATE OF OTHER STRUCTURES	9

Estimating of septic tank, soak pit – sanitary and water supply installations – Water supply pipe line – Sewer line – Tube well – Open well – Estimate of bituminous and cement concrete roads – Estimate of retaining walls.

UNIT III	SPECIFICATION AND TENDERS	9

Data – Schedule of rates – Analysis of rates – Specifications – sources – Preparation of detailed and general specifications – Tenders – TTT Act – e-tender – Preparation of Tender Notice and Document – Contracts – Types of contracts – Drafting of contract documents – Arbitration and legal requirements.

UNIT IV	VALUATION	9

Valuation - Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease

UNIT V	REPORT PREPARATION	9

Principles for report preparation – Report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)

1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO 1 The student shall be able to estimate the material quantities.
CO 2 Explore the knowledge in preparation of cost estimation for quantities during construction.
CO 3 Specification and planning methods in buildings.
CO 4 Students shall be able to prepare value estimates.
CO 5 Prepare tender documents and Report Preparation systems in buildings.

Text Books

1. Dutta, B.N., —Estimating and Costing in Civil Engineering||, UBS Publishers & Distributors Pvt. Ltd., 2003

2. Kohli, D.D and Kohli, R.C., —A Text Book of Estimating and Costing (Civil)||, S.Chand & Company Ltd., 2004

Reference Books

1. PWD Data Book.

2. Tamilnadu Transparencies in Tender Act, 1998

3. Arbitration and Conciliation Act, 1996

4. Standard Bid Evaluation Form, Procurement of Goods or Works, The World Bank, April 1996.4. J.L. Threlkeld, Thermal Environmental Engineering, Prentice Hall, 1970.

Web Recourses

1. https://nptel.ac.in/courses/105/103/105103093/
2. https://www.youtube.com/watch?v=X4iK2xlruEk

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	-	-	-	-	-	-	-	2	1		3
2	3	3	3	-	-	-	-	-	-	-	2	1		3
3	3	3	3	-	-	-	-	-	-	-	2	1		3
4	3	3	3	-	-	-	-	-	-	-	2	1		3
5	3	3	3	-	-	-	-	-	-	-	2	1		3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	10	10	10	10	10
Apply					
Analyze	80	80	80	80	80
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

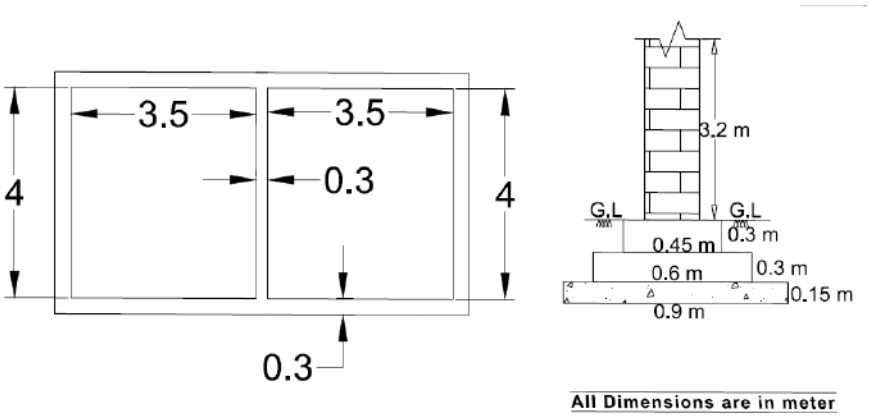
1. Calculate a detailed estimate for the following works as shown in fig1

   (i) Earthwork in excavation (3)

   (ii) Concrete in Foundation (3)

   (iii) 1st Class Brick work in Foundation (3)

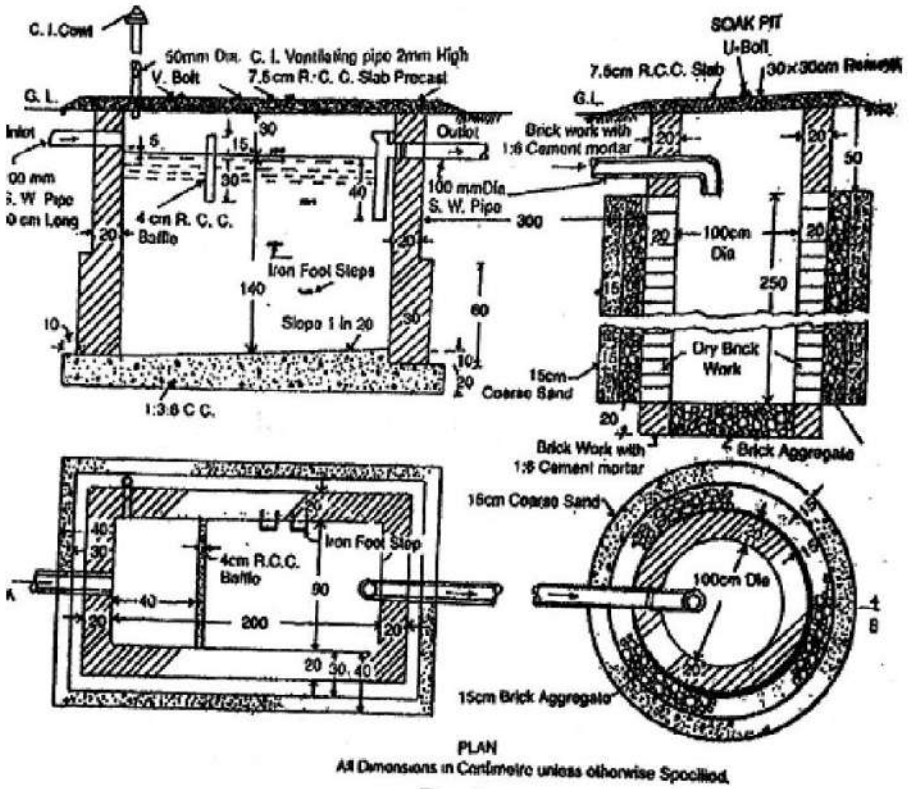
   (iv) 1st Class Brick work in Super Structure. (4)



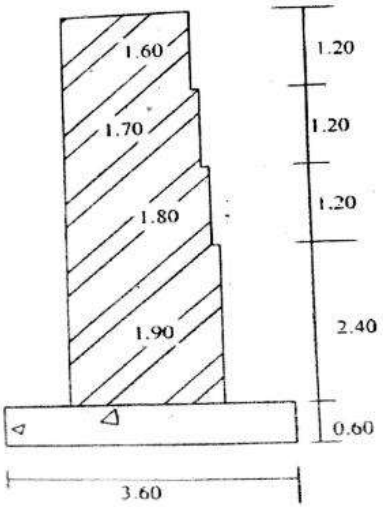
2. Describe in details the different types of estimates in detail

COURSE OUTCOME 2:

1. Prepare a detailed estimate of a Septic tank with Soak pit details as shown in fig 2.



2. Prepare the detailed estimate of quantities for the following items for a 100m length of retaining wall shown in fig3.
   (i)Brickwork in CM (1:4)
   (ii)P.C.C (1:4:8)
   (iii)Number of bricks
   (iv) Number of Cement bags



COURSE OUTCOME 3:

1. Write down detailed specifications of the following
   (i) Cement concrete in foundation (7m)
   (ii) Plastering in cement mortar 1:6 (6m)

2. How will you describe the types of contract and discuss briefly?

COURSE OUTCOME 4:

1. Calculate the Standard Rent of a building with following data:
   Cost of land – Rs. 7,00,000
   Cost of building - Rs. 16,00,000
   Estimate life – 65 years
   Return Expected on Land – 5%
   Return Expected on Building - 8%
   Annual repairs are expected to be 1% of the cost of building.
   Sinking fund on 4% interest basis on 90% of the cost of the building.
   Other outgoing 30% of the return from the building.
2. An RCC framed structure Building having estimated future life of 80 years, fetches a gross annual rent of Rs 2200 per month. Workout its capitalised value on the basis of 6% net yields. The rate of compound interest for sinking fund may be 4%.The other outgoings are
   i) Repair and maintenance = 1/12 of Gross Income
   ii) Municipal and property Taxes = 25% of Gross Income
   iii) Management and Miscellaneous = 7% of Gross Income

   The plinth area of the building is 800m^2 and cost per m^2 may be taken as Rs 500 per m^2.

COURSE OUTCOME 5:

1. Prepare a detailed project report on the estimation of a residential building.
2. Prepare a report on estimate for construction of a culvert and road construction.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	UNIT I - STATICS OF PARTICLES	
1	Introduction - Types of Estimate	1
2	Load bearing and framed structures	1
3	Calculation of quantities of brick work, RCC, PCC, Plastering	1
4	Calculation of quantities of white washing, colour washing and painting / varnishing for shops	1
5	Calculation of quantities of rooms, residential building with flat and pitched roof	1
6	Estimate of joineries for panelled and glazed doors, windows	2

7	Estimate of ventilators, handrails	2
UNIT II ESTIMATE OF OTHER STRUCTURES		
1	Estimating of septic tank	2
2	Estimating of soak pit	2
3	Sanitary and water supply installations	1
4	Water supply pipe line	1
5	Sewer line – tube well – open well	1
6	Estimate of bituminous and cement concrete roads	1
7	Estimate of retaining walls.	1
UNIT III SPECIFICATION AND TENDERS		
1	Data – Schedule of rates	1
2	Analysis of rates – Specifications	1
3	sources – Preparation of detailed and general specifications	2
4	Tenders – TTT Act – e-tender	1
5	Preparation of Tender Notice and Document	1
6	Contracts – Types of contracts	1
7	Drafting of contract documents – Arbitration and legal requirements.	2
UNIT IV VALUATION		
1	Valuation - Necessity of Valuation	1

2	Basics of value engineering	1
3	Capitalised value – Depreciation	2
4	Escalation – Value of building	2
5	Calculation of Standard rent	1
6	Mortgage – Lease	2
UNIT V REPORT PREPARATION		
1	Principles for report preparation	1
2	Report on estimate of residential building	2
3	Report on estimate of Culvert	1
4	Report on estimate of Roads	1
5	Water supply and sanitary installations	2
6	Tube wells	1
7	Open wells.	1

19CE7911	**Innovative Design Project**	**L**	**T**	**P**	**C**
		0	**0**	**6**	**3**

OBJECTIVES:

1. To use the knowledge acquired in Civil Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

PRE-REQISITE:

- Soft computing tools
- Basics knowledge on design and fabrication or algorithms

STRATEGY

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code.

Demonstrate the novelty of the project through the results and outputs

TOTAL HOURS: 60

COURSE OUTCOME(S):

At the end of the course, the students will be able to

CO 1 Implementation of analysis and design in civil engineering problems

CO 2 Development of algorithms and programs to solve civil engineering problems

PO vs CO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PS O1	P S
1	3	3	3	2								2		
2	2	2			3		3					2		

SEMESTER VIII

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
1	21CE8911	Project Work-	EEC	20	0	0	20	10
			Total	**20**	**0**	**0**	**20**	**10**

21CE8911	PROJECT WORK	L	T	P	C
		0	**0**	**20**	**10**

OBJECTIVES:

1. To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
2. To train the students in preparing project reports and to face reviews and viva voce examination

PRE-REQISITE:

- Basic civil engineering knowledge

STRATEGY

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

COURSE OUTCOME(S):

At the end of the course, the students will be able to

CO 1 On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

PO vs CO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	3	1			1	2		2	2		

PROFESSIONAL ELECTIVE I

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/ Domain
1	21CE5701	Geographic Information System	5	3	0	0	3	Geo informatics
2	21CE5702	Pavement Design	5	3	0	0	3	Transportation
3	21CE5703	Construction Planning and Scheduling	5	3	0	0	3	Construction
4	21CE5704	Disaster Preparedness and Planning	5	3	0	0	3	Safety Engineering
5	21CE5705	Non Destructive Testing of Materials	5	3	0	0	3	Construction Material
6	21CE5706	Hydrology and irrigation Engineering	5	3	0	0	3	Water resources

21CE5701	GEOGRAPHIC INFORMATION SYSTEM	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Surveying I & II

Objectives

1. To introduce the fundamentals and components of Geographic Information System
2. To provide details of spatial data structures and input, management and output processes.

UNIT I	FUNDAMENTALS OF GIS	9

Introduction to GIS - Coordinate Systems – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – scales/ levels of measurements.

UNIT II	SPATIAL DATA MODELS	9

Database Structures – ER diagram - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data models - OGC standards - Data Quality.

UNIT III	DATA INPUT AND TOPOLOGY	9

Scanner - Raster Data Input – Raster Data File Formats – Vector Data Input –Digitiser –Topology - Adjacency, connectivity and containment – Topological Consistency rules – Attribute Data linking – ODBC – GPS - Concept GPS based mapping.

UNIT IV	DATA ANALYSIS	9

Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilization

UNIT V	APPLICATIONS	9

GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Have basic ideas about the fundamentals of GIS.
CO2: Understand the types of data models.
CO3: Get knowledge about data input and topology.
CO4: Gain knowledge on data quality and standards.
CO5: Understand data management functions and data output

Text Books

1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011.
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction Geographical Information Systems, Pearson Education, 2nd Edition,2007.Publications 2013.

Reference Books

1. Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006.
2. Peter A Burrough, "Principles of Geographical Information Systems", 1 st Edition, Oxford publisher, 1998.
3. Bernhardsen, "Geographic Information Systems, an Introduction", 3 rd Edition, Published by John Wiley Sons, 2006.

Web Resources

1. https://onlinecourses.nptel.ac.in/noc22_ce84/preview

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3		3			3				3	2	3	3
2		3	3	3	3		3				3	2	3	3
3		3	2	3	3	3	3				3	2	3	3
4		3	2	3	3		3	3			3	2	3	3
5		3	2	3	3		3	3		3	3	2	3	3

BLOOMS LEVEL ASSESSMENT PATTERN

Blooms Category	Cat 1	Cat 2	Fat 1	Fat 2	End Sem exam
Remember	50	50	50	50	50
Understand	50	50	50	50	50
Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Describe in detail the various components of GIS.
2. Illustrate the spatial and attribute data with an example.

COURSE OUTCOME 2:

1. Examine in detail about different types of Database Data Models
2. Compare and contrast raster and vector data structures.

COURSE OUTCOME 3:

1. Discuss in detail about Topology. Also discuss about topology consistency rules
2. Explain in detail about the services provided by Global Positioning System

COURSE OUTCOME 4:

1. Explain in detail about vector data analytics.
2. Explain in detail about 3D data collection and utilization.

COURSE OUTCOME 5:

1. Explain about the application of GIS in natural resource management.
2. Explain about the role of GIS in the fleet management system.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - FUNDAMENTALS OF GIS		
1	Introduction to GIS	1
2	Coordinate Systems	1
3	History of GIS	1
4	Components of a GIS	2
5	Hardware, Software, Data, People, Methods	1
6	Proprietary and open source Software	2
7	Types of data – scales/ levels of measurements.	1
Unit II SPATIAL DATA MODELS		
1	Database Structures	1
2	ER diagram	1
3	spatial data models	1
4	Raster Data Structures	1
5	Raster Data Compression	1
6	Vector Data Structures	1
7	TIN and GRID data models	1
8	OGC Standards	1
9	Data Quality.	1

Unit III DATA INPUT AND TOPOLOGY		
1	Scanner	1
2	Raster Data Input	1
3	Vector Data Input	1
4	Digitiser, Topology	1
5	Adjacency, connectivity and containment	1
6	Topological Consistency rules	1
7	Attribute Data linking	1
8	ODBC	1
9	GPS	1
Unit IV DATA ANALYSIS		
1	Vector Data Analysis tools	2
2	Data Analysis tools	2
3	Network Analysis	1
4	Digital Education models	2
5	3D data collection and utilization	2
Unit V APPLICATIONS		
1	GIS Applicant	2
2	Natural Resource Management	1

3	Engineering	1
4	Navigation	1
5	Vehicle tracking and fleet management	1
6	Marketing and Business applications	1
7	Case studies	2

21CE5702	PAVEMENT DESIGN	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Highway Engineering
- Traffic Engineering

Objectives

1. To gain knowledge on various IRC guidelines for designing flexible and rigid pavements.
2. To assess quality and serviceability conditions of roads.

UNIT I	TYPE OF PAVEMENT AND STRESS DISTRIBUTION	9

Introduction – Pavement as layered structure – Pavement types- rigid and flexible. Resilient modulus - Stress and deflections in pavements under repeated loading.

UNIT II	DESIGN OF FLEXIBLE PAVEMENTS	9

Flexible pavement design, Factors influencing design of flexible pavement, Empirical – Mechanistic empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.

UNIT III	DESIGN OF RIGID PAVEMENTS	9

Rigid pavement design, Factors influencing cement concrete pavement – Modified Westergaard‘s approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India

UNIT IV	PERFORMANCE EVALUATION AND MAINTENANCE	9

Pavement Evaluation - Causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural Evaluation by Deflection Measurements - Pavement Serviceability index, - Pavement maintenance (IRC Recommendations only).

UNIT V	STABILIZATION OF PAVEMENTS	9

Stabilization with special reference to highway pavements – Choice of stabilizers – Testing and field control - Stabilization for rural roads in India – Use of Geosynthetics in roads.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Identify the pavement types.
CO2: Design the flexible pavement using empirical methods
CO3: Design rigid pavements by IRC method and evaluate the pavements
CO4: Assess quality and serviceability conditions of roads
CO5: Apply the various design procedure of pavement design in real time.

Text Books

1. Khanna, S.K. and Justo C.E.G and Veeraragavan, A, —Highway Engineering||, New Chand and Brothers,Revised 10th ed., 2014.
2. Kadiyali, L.R., —Principles and Practice of Highway Engineering||, Khanna Tech. Publications, New Delhi, 2005.

Reference Books

1. Yoder, R.J. and Witchak M.W. —Principles of Pavement Design||, John Wiley 2000.
2. Guidelines for the Design of Flexible Pavements, IRC-37–2001, The Indian roads Congress, New Delhi.
3. Guideline for the Design of Rigid Pavements for Highways, IRC 58-1998, The Indian Road Congress, New Delhi.

Web Resources

1. https://nptel.ac.in/courses/105/101/105101008/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3		2			2							2
2	3	3	3	3							3		2	
3	3	3	3	3							3		2	
4	3	3	2	2			2				2			2
5	1			2	2		2				3	2		2

BLOOMS LEVEL ASSESSMENT PATTERN

Blooms Category	Cat 1	Cat 2	Fat 1	Fat 2	End Sem exam
Remember	10	10	10	10	10

Understand	60	50	60	50	40
Apply	30		30		20
Analyze		40		40	30
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Describe the desirable properties of pavaments
2. Bring out the characteristic differences between flexible and rigid pavements.

COURSE OUTCOME 2:

1. Plot the trend of following in a Marshall mix design a) Voids in Mineral aggregate v/s Bitumen content; b) Voids filled with bitumen v/s Bitumen content, c) Air voids v/s Bitumen content; d) Marshall Stability v/s Bitumen content; e) Marshall Flow v/s Bitumen content

2. A circular load having radius of 152 mm and uniform pressure 0.56 MPa is applied on two layer system. The subgrade has elastic modulus of 35MPa and can support a maximum vertical stress of 0.056 MPa. If bituminous layer has elastic modulus of 3500 MPa, what is the required thickness of a full depth pavement?

COURSE OUTCOME 3:

1. A plate bearing test using a 75cm plate was made on a subgrade as well as on 26cm of gravel base course. Unit load required to cause settlement of 0.5cm was 0.67kg/cm2 and 2.67kg/cm2 respectively. Determine the required thickness of base course to sustain 25000kg, 6.67 kg/cm2 pressure and maintain a deflection of 0.5cm.
2. List the various Empirical methods of Pavement Design? What are the drawbacks?

COURSE OUTCOME 4:

1. Explain how climatic variation affects pavement design and performance.

2. Explain the methods for structural evaluation of bituminous pavement.

COURSE OUTCOME 5:

1. Explain in detail the need and mix design procedure in mechanical soil stabilization.
2. What are the desirable properties of subgrade soil, How is the strength of soil tested?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I -TYPE OF PAVEMENT AND STRESS DISTRIBUTION		
1	Introduction	2
2	Pavement as layered structure	1
3	Pavement types	2
4	rigid and flexible. Resilient modulus	2
5	Stress and deflections in pavements under repeated loading	2
Unit II DESIGN OF FLEXIBLE PAVEMENTS		
1	Flexible pavement design	2
2	Factors influencing design of flexible pavement	1
3	Empirical	1
4	Mechanistic empirical and theoretical methods	1
5	Design procedure as per IRC guidelines	2
6	Design and specification of rural roads.	2
Unit III DESIGN OF RIGID PAVEMENTS		
1	Rigid pavement design	2
2	Factors influencing cement concrete pavement	1
3	Modified Westergaard‘s approach	2
4	Design procedure as per IRC guidelines	2
5	Concrete roads and their scope in India	2
Unit IV PERFORMANCE EVALUATION AND MAINTENANCE		

1	Pavement Evaluation	1
2	Causes of distress in rigid and flexible pavements	1
3	Evaluation based on Surface Appearance,Cracks	1
4	Evaluation based on Patches and Pot Holes	1
5	Evaluation based on Undulations, Raveling	1
6	Evaluation based on Roughness, Skid Resistance.	1
7	Structural Evaluation by Deflection Measurements	1
8	Pavement Serviceability index	1
9	Pavement maintenance (IRC Recommendations only).	1
Unit V STABILIZATION OF PAVEMENTS		
1	Stabilization with special reference to highway pavements	2
2	Choice of stabilizers	1
3	Testing and field control	2
4	Stabilization for rural roads in India	2
5	Use of Geosynthetics in roads.	2

21CE5703	CONSTRUCTION PLANNING AND SCHEDULING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Construction Techniques and Practices
- Concrete Technology

Objectives

At the end of this course the student is expected to have learnt how to planconstruction projects, schedule the activities using network diagrams, determine the cost ofthe project, control the cost of the project by creating cash flows and budgeting and how touse the project information as an information and decision making tool.

UNIT I	INTRODUCTION & PROJECT PLANNING	9

Basic concepts in the development of construction plans - choice of Technology. Importance of planning in construction project – Different periods of planning – Pretender data collection, analysis and report; Activity –time scheduling; Charts for labour, staff, material and plant requirements; BOQ and cost estimates; Pre contract and Contract planning. Coding Systems.

UNIT II	PROJECT SCHEDULING &RESOURCE AGGREGATION	9

Bar Chart scheduling – its merits and shortcomings; CPM/ PERT Network – Activities, their duration and interdependence; Construction of network diagram; activities and events; activity start and finish time both early and late; forward and backward pass; critical period and critical path; Float; PERT - three time aspects and their identification based on statistical data and Beta distribution – Probability of achieving desired time targets for projects.

UNIT III	COST CONTROL MONITORING AND ACCOUNTING	9

The cost control problem-The project Budget-Forecasting for Activity cost control -financial accounting systems and cost accounts-Control of project cash flows-Schedulecontrol-Schedule and Budget updates-Relating cost and schedule information.

UNIT IV	QUALITY CONTROL AND SAFETY DURING CONSTRUCTION	9

Quality and safety Concerns in Construction - Organizing for Quality and Safety - Work and Material Specifications - Total Quality control - Quality control by statistical methods - Statistical Quality control with Sampling by Attributes - Statistical Quality control by Sampling and Variables – Safety

UNIT V	ORGANIZATION AND USE OF PROJECT INFORMATION	9

Introduction to application software.Types of project information-Accuracy and Use of Information-Computerized organizationand use of Information -Organizing information in databases-relational model of Databases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO 1 Understand the requirement of planning techniques exercised in the construction projects
CO 2 Choose suitable scheduling technique for the particular project.
CO 3 Practice modern cost account systems and control techniques adopted.
CO 4 Employ the advanced management tools for quality control.
CO 5 Organize information in Centralized database Management systems.

Text Books

1. Chitkara, K.K. "Construction Project Management Planning", Schedulingand Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.

2. Srinath,L.S., "Pert and CPM Priniples and Applications ", Affiliated EastWest Press,2001.

3. Shrivastava U K, —Construction Planning and Management—, Galgotia Publications Pvt. Ltd., New Delhi, 2000.

4. Ghattas R G and Sandra L Mckee, ‗ Practical Project Management‖, Pearson Education (P) Ltd., New Delhi, 2003.

Reference Books

1. Punmia B C and Khandelval K K, —Project Planning and Control with PERT and CPM‖, Laxmi Publications, 1993.
2. Srinath L S, —PERT/CPM principles and Applications‖, Affiliated East West Press(P) ltd., 2002.
3. Vazirani and Chandola, —Construction Management and Accounts‖, Khanna Publishers, Delhi, 1989.
4. Sharma J C, —Construction Management and Accounts‖, Satya Prkashan, New Delhi, 1986.

Web Resources

4. https://archive.nptel.ac.in/courses/105/106/105106149/
5. https://nptel.ac.in/courses/105104161

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1												1		
2	2	2											2		
3	1	1	1	2				1					1	2	
4	3	3	1	3				2					3	2	
5	1	1	3	1	1	3	1		1	1	2	1	1	3	

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	40	30	40	30
Understand	40	20	30	30	30
Apply	20	30	30	10	30
Analyze	20	10	10	10	10
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain the various factors deciding the activity durations.
2. Explain briefly Choice of Construction Technology and Construction method?

COURSE OUTCOME 2:

1. Explain Scheduling with Resource Constraints and Precedence
2. Write about Critical path method with neat sketches and illustrations.

COURSE OUTCOME 3:

1. Explain the type of Accounting system in detail
2. Explain Cash flow control in detail. Also write a short note on Schedule control.

COURSE OUTCOME 4:

1. What are the main cause of accidents? Explain the various safety measures followed in the construction industry.
2. Explain Statistical Quality Control with Sampling by Attributes

COURSE OUTCOME 5:

1. Explain how Centralized Database Management Systems is used in construction industry?
2. Explain the computerized organization and use of information in detail.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
Unit I - INTRODUCTION &PROJECT PLANNING		
1	Basic concepts in the development of construction plans	1
2	Choice of Technology.	1
3	Importance of planning in construction project	1
4	Different periods of planning	1
5	Pretender data collection, analysis and report;	1
6	Activity –time scheduling; Charts for labor, staff, material and plant requirements;	1
7	BOQ and cost estimates; Pre contract and Contract planning; Master Program.	2
8	Coding System	1
Unit II - PROJECT SCHEDULING &RESOURCE AGGREGATION		
1	Bar Chart scheduling – its merits and shortcomings	1
2	CPM/ PERT Network - Activities, their duration and interdependence;	1
3	Construction of network diagram; activities and events;	1
4	activity start and finish time both early and late; forward an backward pass	1
5	critical period and critical pathFloat	1

6	PERT - three time aspects and their identification based on statistical data and Beta distribution	1
7	PERT - three time aspects - Problem	1
8	Probability of achieving desired time targets for projects..	1
9	Resource aggregation as per early start time and initial histogram	1
Unit III COST CONTROL MONITORING AND ACCOUNTING		
1	The cost control problem-	1
2	The project Budget-Forecasting for Activity cost control -	1
3	financial accounting systems and cost accounts-	1
4	Control of project cash flows-	1
5	Schedulecontrol-	1
6	Schedule and Budget updates-	1
7	Relating cost and schedule information.	1
8	Problems related to financial accounting	2
Unit IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION		
1	Quality and safety Concerns in Construction-	1
2	Organizing for Quality and Safety-	1
3	Workand Material Specifications	1
4	-Total Quality control-	1
5	Quality control by statistical methods -	1
6	Statistical Quality control with Sampling by Attributes-	2
7	Statistical Quality control bySampling and Variables-	1
8	Safety during construction	1
Unit V ORGANIZATION AND USE OF PROJECT INFORMATION		
1	Types of project information	1

2	Accuracy and Use of Information-	1
3	Computerized organization and use of Information -	1
4	Organizing information in databases-relational model of Data bases-	1
5	Other conceptual Models of Databases-	1
6	Centralized database Management systems-	2
7	Databases and application programs	1
8	Information transfer and Flow.	1

21CE5704	DISASTER PREPAREDNESS AND PLANNING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Building Materials And Construction
- Engineering Geology

Objectives

1. To provide an exposure on the various elements of natural disasters
2. To impart knowledge on measurement, effect and management techniques for different disasters

UNIT I	INTRODUCTION TO DISASTER MANAGEMENT	9

Fundamentals of disasters-Causal factors of disasters - Poverty, Population growth, Rapid urbanization, Transitions in cultural practices, Environmental degradation, War and civil strife - Earthquakes -Tropical cyclones - Floods -Droughts- Environmental pollution - Deforestation - Desertification - Epidemics - Chemical and industrial accidents- Global Disaster Trends and Preventive measures -Climate Change and Urban Disasters.

UNIT II	COASTAL AND MARINE DISASTERS	9

Hydrological, Coastal and marine disasters -Flood hazards, Control and management-Dams and dam bursts-Tsunami-Water and groundwater hazards - Sea level rise -Coastal and marine degradation Marine pollution - Techniques of marine pollution control- Case study on Coastal and marine disasters.

UNIT III	ATMOSPHERIC AND LAND DISASTERS	9

Atmospheric disasters - Greenhouse effect and global climate - Air pollution and acid rain - Ozone depletion- Forest related disasters - Biodiversity extinction - Deforestation and loss of biological diversity - genetic manipulation - Bio -safety and CBD- Land Degradation and land use -Mining disasters- Case study on earthquake.

UNIT IV	INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT	9

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

UNIT V	DISASTER MANAGEMENT CYCLE AND FRAMEWORK	9

Disaster Management Cycle - **Pre-Disaster** - Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Role of Government in reducing disaster – Rules and regulations in India, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; **During Disaster**- Awareness, Evacuation-Disaster Communication, Search and Rescue, Emergency Operation Centre, Relief and Rehabilitation; **Post-disaster** - Damage and Needs Assessment, Early Recovery, Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action; Advanced technologies in Disaster Management.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Characterize the various natural and man- made disasters.

CO2: Identify the various types of disasters in coastal and marine and techniques to control marine pollution.

CO3: Explain the causes, effects of atmospheric pollution and land pollution.

CO4: Analyze the inter-relationship between disasters and development

CO5: Interpret the importance of various disaster management cycles and frameworks.

Text Books

1. B.K.Khanna, All you wanted to know about disasters, New India Publishing Agency, NewDelhi, 2005
2. William L Waugh, Living with hazards, dealing with disasters: An Introduction to Emergency Management, Amazon Publications, 2002

Reference Books

1. P.Jegadish Gandhi, Disaster mitigation and management Deep & Deep Publications, 2007 4. Patrick Leon Abbott, Natural Disasters, Amazon Publications, 2002
2. Ben Wisner, At Risk : Natural Hazards, People vulnerability and disasters, Amazon Publications, 2001
3. D.B.N.Murthy, Disaster management: text and case studies, Deep & Deep Publications, 2007.

Web Resources

1. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/124107007/lec35.pdf
2. https://nptel.ac.in/courses/105104183/
3. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105104183/lec5.pdf

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-	-	1	1	2	-	-	-	-	1	2		2
2	-	-	-	1	-	1	-	2	-	-	1	1		2
3	1	-	1	1	-	2	1	-	-	-	1	2		2
4	1	-	-	-	1	1	-	2	-	-	1	2		2
5	-	-	1	2	1	1	-	-	-	-	1	1		2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	50	50	50	50	50
Apply	30	30	30	30	30
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. What are the different types of natural disasters? Explain in detail.
2. Explain the causal factors of disasters in detail.

COURSE OUTCOME 2:

1. Explain in detail the causes and effects of climate change.
2. Explain in detail about the forest related disasters.

COURSE OUTCOME 3:

1. Explain greenhouse effect and its effect on global climate change.
2. What is meant by biosafety? Explain the convention on biological disaster(CBD).

COURSE OUTCOME 4:

1. Explain in brief about the factors affecting vulnerability.
2. Write about the impacts of developmental projects on biodiversity.

COURSE OUTCOME 5:

1. What are the components of Community Based Disaster Management? Explain in detail.
2. What is an early warning system? How does an early warning system work for different disasters?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION TO DISASTER MANAGEMENT		
1	Fundamentals of disasters	1
2	Causal factors of disasters-Poverty - Population growth	1

3	Rapid urbanization - Transitions in cultural practices	1
4	Environmental degradation -War and civil strife	1
5	Earthquakes -Tropical cyclones	1
6	Floods -Droughts	1
7	Environmental pollution - Deforestation -Desertification	1
8	Epidemics - Chemical and industrial accidents	1
9	Global Disaster Trends-Climate Change and Urban Disasters	1
Unit II COASTAL AND MARINE DISASTERS		
1	Hydrological-Coastal and marine disaster	1
2	Flood hazards- Control and management	1
3	Dams and dam bursts	1
4	Tsunami	1
5	Water and ground water hazards	1
6	Sea level rise - Coastal and marine degradation	1
7	Marine pollution	1
8	Techniques of marine pollution control	1
9	Case study on Coastal and marine disasters.	1
Unit III ATMOSPHERIC AND LAND DISASTERS		
1	Atmospheric disasters - Green house effect and global climate	1
2	Air pollution and acid rain - Ozone depletion	2
3	Forest related disasters - Bio diversity extinction - Deforestation and loss of biological diversity - genetic manipulation	2
4	Bio -safety and CBD	2
5	Land Degradation and land use -Mining disasters	1
6	Droughts and famines- Case study on earthquake	1
Unit IV INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT		

1	Factors affecting Vulnerabilities	1
2	Differential impacts, impact of Development projects such as dams, embankments	2
3	Changes in Land-use	2
4	Climate Change Adaptation	1
5	IPCC Scenario and Scenarios in the context of India Relevance of indigenous knowledge, appropriate technology and local resources	3
Unit V DISASTER MANAGEMENT CYCLE AND FRAMEWORK		
1	Disaster Management Cycle - Paradigm Shift in Disaster Management	1
2	Pre-Disaster- Risk Assessment and Analysis	1
3	Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System	1
4	Preparedness, Capacity Development	1
5	Awareness During Disaster- Evacuation-Disaster Communication -Search and Rescue	1
6	Emergency Operation Centre-Incident Command System	1
7	Relief and Rehabilitation-Post-disaster-Damage and Needs Assessment, Restoration of Critical Infrastructure	1
8	Early Recovery- Reconstruction and Redevelopment	1
9	IDNDR, Yokohama Strategy, Hyogo Framework of Action	1

21CE5705	NON DESTRUCTIVE TESTING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Concrete Technology

Objectives

1. To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications.

UNIT I	OVERVIEW OF NON-DESTRUCTIVE TEST(NDT)	9

NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of material characterisation. Relative merits and limitations, Various physical characteristics of structural applications in NDT. Visual inspection.

UNIT II	STRUCTURAL TESTING METHODS ON CONCRETE	9

Schmidt Rebound hammer- Methodology and evaluation, Ultrasonic Pulse Velocity(UPV)- Sonic integrity and transmission methods- Principle, Transducers, and pulse-echo method, straight beam and angle beam, instrumentation, data representation.

UNIT III	SURFACE NON-DESTRUCTIVE EVALUATION METHODS	9

Electrical Resistivity method, Half cell potential test, Cover meter, Rebar and magnetic concrete cover, MIP - Test Testing Procedure, Interpretation of results,.

UNIT IV	SEMI DESTRUCTIVE TEST ON CONCRETE	9

Core Test, Pull out Test Impact Test, Penetration Test (Windsor Probe System) Echo Test – Principle- methodology- data representation

UNIT V	SPECIAL NDT ON CONCRETE	9

Radiographic Evaluation of concrete, Topographic Modelling, Ground Penetrating Radar, IR thermographs for concrete - Principle- methodology- data representation

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
2. Descriptive written exam	3. Assignments 4. Quiz	2. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1 : Distinguish the fundamental concepts of NDT
CO2 : Demonstrate the structural testing methods on concrete

CO3 : Demonstrate and evaluate the surface non-destructive test on concrete
CO4 : Execute semi destructive test on concrete
CO5 : Execute special NDT on concrete

Text Books

1.Baldev Raj, T.Jayakumar, M.Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House, 2009.

2.Ravi Prakash, "Non-Destructive Testing Techniques", 1st revised edition, New Age International Publishers, 2010.

Reference Books

1.ASM Metals Handbook,"Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17.

2.Paul E Mix, "Introduction to Non-destructive testing: a training guide", Wiley, 2nd Edition New Jersey, 2005

3.Charles, J. Hellier," Handbook of Nondestructive evaluation", McGraw Hill, New York 2001.

4.ASNT, American Society for Non Destructive Testing, Columbus, Ohio, NDT Handbook,Vol. 1, Leak Testing, Vol. 2, Liquid Penetrant Testing, Vol. 3, Infrared and Thermal Testing Vol. 4, Radiographic Testing, Vol. 5, Electromagnetic Testing, Vol. 6, Acoustic Emission Testing, Vol.7, Ultrasonic Testing

Web Resources

1. https://onlinecourses.nptel.ac.in/noc20_mm07/preview
2. https://archive.nptel.ac.in/courses/113/106/113106070/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1					1	1	1		2		
2	3	3	1					1	1	1		2		
3	3	3	1					1	1	1		2		
4	3	3	1					1	1	1		2		
5	3	3	1					1	1	1		2		
6	3	3	1					1	1	1		2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember					

Understand	100	100	100	100	100
Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Discuss briefly about the visual inspection and instruments used for visual inspection?
2. Discuss in detail about the Relative merits and limitations, Various physical
3. characteristics of materials and their applications in NDT.

COURSE OUTCOME 2:

1. Explain the following
   (i)Principal requirements of penetrants.
   (ii)Properties of penetrants

2. Explain in detail about the equipment used in determination of magnetic field strength and direction.

COURSE OUTCOME 3:

1. List and explain in detail about the laws of thermal imaging in Thermograph test.

2. Evaluate the procedure for detecting fatigue crack in the materials by eddy current inspection technique.

COURSE OUTCOME 4:

1. Illustrate the principle of pulse echo method with neat sketch in ultrasonic testing method.

2. Explain with neat sketch about the data presentation methods in Ultrasonic test of non destructive testing

COURSE OUTCOME 5:

1. Explain about the process of Neutron Radiography and Computed Tomography.

2. Illustrate the components of X-ray generator with suitable sketch.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - OVERVIEW OF NON-DESTRUCTIVE TEST(NDT)		
1	NDT Versus Mechanical testing,	1
2	Overview of the Non Destructive Testing Methods for the detection of material characterisation.	1
3	Various physical characteristics of materials	1
4	Relative merits and limitations,	2
5	Various physical characteristics of structural applications in NDT.	2
6	Visual inspection	2
Unit II STRUCTURAL TESTING METHODS ON CONCRETE		
1	Schmidt Rebound hammer-	2
2	Methodology and evaluation,	2
3	Ultrasonic Pulse Velocity(UPV)-	2
4	Sonic integrity and transmission methods-	1
5	Principle, Transducers, and pulse-echo method,	1
6	straight beam and angle beam, instrumentation, data representation.	1
Unit III SURFACE NON-DESTRUCTIVE EVALUATION METHODS		
1	Electrical Resistivity method,	2
2	Half cell potential test,	2
3	Cover meter, Rebar and magnetic concrete cover, MIP -	2

4	Test Testing Procedure, Interpretation of results,.	3
Unit IV SEMI DESTRUCTIVE TEST ON CONCRETE		
1	Core Test,	2
2	Pull out Test Impact Test,	2
3	Penetration Test (Windsor Probe System)	2
4	Echo Test – Principle- methodology- data representation	3
Unit V SPECIAL NDT ON CONCRETE		
1	Radiographic Evaluation of concrete,	2
2	Topographic Modelling,	2
3	Ground Penetrating Radar,	2
4	IR thermographs for concrete	3

21CE5706	HYDROLOGY AND IRRIGATION ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Mechanics of Fluids
- Environmental Science and Engineering

Objectives

1. To provide knowledge to students regarding occurrence of rainfall, storage of water, estimation of flood.
2. To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology.
3. To impart required knowledge on Irrigation storage and distribution canal system.

UNIT I	INTRODUCTION ABOUT PRECIPITATION	9

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Intensity, duration, frequency relationship.

UNIT II	ABSTRACTION FROM PRECIPITATION AND HYDROGRAPHS	9

Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Factors affecting Hydrograph – Baseflow separation – Unit hydrograph – basic concept of unit hydrograph.

UNIT III	FLOOD AND FLOOD ROUTING WELL HYDRAULICS	9

Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control. Types of aquifers – Darcy's law – Dupuit's assumptions – Pumping test.

UNIT IV	CROP WATER REQUIREMENT	9

Need and classification 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 V	CANAL IRRIGATION DIVERSION AND IMPOUNDING STRUCTURES	9

Canal regulations – Direct sluice – Canal drop – Cross drainage works-Canal lining – Kennedy's and Lacey's Regime theory. Tank irrigation – Well irrigation, Types of Impounding structures – Gravity dam, Earth dams - Diversion Head works – Weirs and Barrages.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Written Test	MCQ	Written Test

Outcomes

Upon completion of the course, the students will be able to:

CO 1 To analyze the rainfall-runoff data and quantity of water that can be derived from nature
CO 2 Gain the knowledge needed on hydrologic cycle and formation of precipitation and Analyse the concept of hydrographs.
CO 3 Explain the measures of flood control and flood routing
CO 4 Have knowledge and skills on crop water requirements.
CO 5 Understand methods of irrigation including canal irrigation and gain knowledge on types of impounding structures.

Text Books

1. Subramanya .K. "Engineering Hydrology"- Tata McGraw Hill, 2010
2. Jayarami Reddy .P. "Hydrology", Tata McGraw Hill, 2008.
3. Linsley, R.K. and Franzini, J.B. "Water Resources Engineering", McGraw Hill International Book Company, 1995.
4. Santosh Kumar Garg, "Hydrology and Water Resources Engineering", Khanna Publications Private Limited, New Delhi, 2009.
5. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
6. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009.
7. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009.

Reference Books

REFERENCES

1. Chow, V.T. and Maidment, "Hydrology for Engineers", McGraw-Hill Inc., Limited, 2000
2. Singh, V.P., "Hydrology", McGraw-Hill Inc., Limited, 2000.
3. Duggal, K.N. and Soni, J.P., Elements of Water Resources Engineering, New Age International Publishers, 2005
4. Linsley R.K. and Franzini J.B, Water Resources Engineering, McGraw-Hill Inc, 2000
5. Sharma R.K.. "Irrigation Engineering", S.Chand and Co. 2007.
6. Michael A.M., Irrigation Theory and Practice, 2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, Up, 2008
7. Asawa, G.L., Irrigation Engineering, NewAge International Publishers, New Delhi, 2000.

Web Resources

1. https://nptel.ac.in/courses/105101002
2. https://nptel.ac.in/courses/105102159

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2			3		3		1		2	2		
2	2	3	2		3		2				1	2		
3	1	2	3	1	3		3					2		
4	2	2					3					2		

5	2	3	2									2		
6	2	2			3		3		1		2	2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	40	40	40	40	40
Apply	20	20	20	20	20
Analyze	10	10	10	10	10
Evaluate	10	10	10	10	10
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Describe the salient characteristics of precipitation in India.
2. What are the precautions to be observed during the selection of site for a raingauge?

COURSE OUTCOME 2:

1. Describe about the factors affecting infiltration and losses of precipitation.
2. Determine the E.T and irrigation requirement for a wheat, if the water application efficiency is 65% and the coefficient of the growing season (Cu) is 0.8 from the following data.

Month	Mean monthly Temperature	Monthly % of sunshine	Effective rainfall (cm)
Nov	20	7.20	2.5
Dec	17	7.15	2.7
Jan	15	7.25	3.4
Feb	16	7.15	2.1

COURSE OUTCOME 3:

1. What are the factors affecting flood hydrograph? Explain.
2. Estimate the peak flow and the time of its occurrence in a flood created by a 8 hr storm, which results in 2.5 cm of effective rainfall during the first 4 hours and 3.75 cm of effective rainfall during the second 4 hours. Assume the base flow as negligible.

COURSE OUTCOME 4:

1. Define irrigation. What is the necessity for irrigation and what are the advantages of direct and indirect benefits of irrigation?
2. Derive the relationship between 'duty', 'delta' and 'base period'. What are the factors affecting duty?

COURSE OUTCOME 5:

1. Briefly explain about canal irrigation? Explain the distribution system of canal irrigation.
2. What is elementary profile of gravity dam? What are the factors acting on a gravity dam?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION ABOUT PRECIPITATION		
1	Hydrologic cycle.	1
2	Types of precipitation – Forms of precipitation	2
3	Measurement of Rainfall	2
4	Spatial measurement methods	2
5	Temporal measurement methods – Intensity, duration, frequency relationship.	2
Unit II ABSTRACTION FROM PRECIPITATION AND HYDROGRAPHS		
1	Losses from precipitation.	2
2	Evaporation process, Reservoir evaporation	2
3	Factors affecting Hydrograph – Base flow separation	1
4	Infiltration process –Infiltration capacity	2
5	Unit hydrograph – basic concept of unit hydrograph.	2
Unit III FLOOD AND FLOOD ROUTING WELL HYDRAULICS		

1	Flood frequency studies – Recurrence interval – Gumbel's method.	2
2	Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control.	3
3	Types of aquifers – Darcy's law – Dupuit's assumptions –	2
4	Pumping test.	2
Unit IV CROP WATER REQUIREMENT		
1	Need and classification of irrigation.	1
2	Types of crops - crop season – duty.	1
3	Delta and base period.	2
4	Consumptive use of crops.	2
5	Estimation of Evapo transpiration using experimental and theoretical methods.	3
Unit V CANAL IRRIGATION DIVERSION AND IMPOUNDING STRUCTURES		
1	Canal regulations – Direct sluice.	2
2	Cross drainage works-Canal lining – Kennedy's and Lacey's Regime theory.	2
3	Tank irrigation – Well irrigation,	1
4	Types of Impounding structures – Gravity dam, Earth dams	2
5	Diversion Head works – Weirs and Barrages.	2

PROFESSIONAL ELECTIVE II

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/ Domain
1	21CE6701	Municipal Solid Waste Management	6	3	0	0	3	Environmental Engineering
2	21CE6702	Remote Sensing	6	3	0	0	3	Geoinformatics
3	21CE6703	Construction Management	6	3	0	0	3	Construction
4	21CE6704	Traffic Engineering	6	3	0	0	3	Transportation
5	21CE6705	Safety in Construction	6	3	0	0	3	Construction
6	21CE6706	Water Resources Systems Engineering	6	3	0	0	3	Water resources

21CE6701	MUNICIPAL SOLID WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Environmental Sciences

Objectives

1. To make the students conversant with the types, sources, generation, storage, collection, transport, processing and
2. To gain knowledge on disposal of municipal solid waste

UNIT I	SOURCES AND CHARACTERISTICS	9

Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal of solid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics - Elements of integrated solid waste management – Solid waste management rules (2016) –Elements of Municipal Solid Waste Management Plan.

UNIT II	SOURCE REDUCTION , WASTE STORAGE AND RECYCLING	9

Waste Management Hierarchy - Reduction, Reuse and Recycling - source reduction of waste – On-site storage methods – segregation of solid wastes – case studies under Indian conditions – Recycling of Plastics and Construction/Demolition wastes.

UNIT III	COLLECTION AND TRANSFER OF WASTES	9

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of waste collection systems; Transfer stations –location, operation and maintenance; options under Indian conditions – Field problems- solving.

UNIT IV	PROCESSING OF WASTES	9

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

UNIT V	**WASTE DISPOSAL**	**9**

Land disposal of solid waste- Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor – Dumpsite Rehabilitation

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Understanding of the nature and characteristics of municipal solid wastes wastes and the regulatory requirements regarding municipal solid waste management.
CO2: Reduction, reuse and recycling of waste.
CO3: Ability to plan and design systems for storage, collection, transport, processing and disposal of municipal solid waste.
CO4: knowledge on the issues on solid waste management from an integrated and holistic perspective, as well as in the local and international context.
CO5: Design and operation of sanitary landfill

Text Books

1. William A. Worrell, P. Aarne Vesilind (2012) Solid Waste Engineering, Cengage Learning, 2012.
2. John Pitchel (2014), Waste Management Practices-Municipal, Hazardous and industrial – CRC Press, Taylor and Francis, New York.

Reference Books

1. CPHEEO (2014), "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization , Government of India, New Delhi.
2. George Tchobanoglous and FrankKreith (2002).Handbook of Solid waste management, McGraw Hill, New York.

Web Resources

1. https://nptel.ac.in/courses/120/108/120108005/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3						3							
2	3	3					3							
3	3	3	3		2		3							3
4	3						3		2					3
5	3	3	3											3

BLOOMS LEVEL ASSESSMENT PATTERN

Blooms Category	Cat 1	Cat 2	Fat 1	Fat 2	End Sem exam
Remember	50	40	50	50	40
Understand	40	50	50	40	50
Apply	10	10		10	10
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Compare and contrast the characteristics of solid waste in Indian cities and that of developed countries.
2. Explain the factors influencing solid waste generation.

COURSE OUTCOME 2:

1. Describe the possibilities in solid waste management with respect to reduction reuse and recovery.
2. Explain the different options for onsite segregation of solid waste keeping public health in mind

COURSE OUTCOME 3:

1. Discuss the common principles to be considered while planning collection routes for MSW.
2. Discuss in detail the various methods of the MSW collection system with flow diagram.

COURSE OUTCOME 4:

1. Explain the working principle of a solid waste incinerator with a suitable sketch.
2. Discuss the windrow composting process with aid of a schematic diagram.

COURSE OUTCOME 5:

1. Discuss the sanitary landfilling process with neat sketch.
2. Explain the salient features of landfill bio reactor.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - SOURCES AND CHARACTERISTICS		
1	Sources of municipal solid wastes	1
2	Types of municipal solid wastes	1
3	Public health and environmental impacts of improper disposal of solid wastes	1
4	Sampling of wastes	1
5	Characterization of wastes	1
6	factors affecting waste generation rate and characteristics	1
7	Elements of integrated solid waste management	1
8	Solid waste management rules (2016)	1
9	Elements of Municipal Solid Waste Management Plan.	1
Unit II SOURCE REDUCTION , WASTE STORAGE AND RECYCLING		
1	Waste Management Hierarchy	1
2	Reduction, Reuse and Recycling	1
3	source reduction of waste	1
4	On-site storage methods	2

5	segregation of solid wastes	2
6	case studies under Indian conditions	1
7	Recycling of Plastics and Construction/Demolition wastes.	1
Unit III COLLECTION AND TRANSFER OF WASTES		
1	Methods of Residential and commercial waste collection	1
2	Collection vehicles	1
3	Manpower	1
4	Collection routes	1
5	Analysis of waste collection systems	1
6	Transfer stations location, operation and maintenance	1
7	options under Indian conditions	1
8	Field problems- solving.	2
Unit IV PROCESSING OF WASTES		
1	Objectives of waste processing	1
2	Physical Processing techniques and Equipment	2
3	Resource recovery from solid waste composting and biomethanation	2
4	Thermal processing options	2
5	case studies under Indian conditions.	2
Unit V WASTE DISPOSAL		
1	Land disposal of solid waste	1
2	Sanitary landfills	1
3	site selection, design and operation of sanitary landfills	2
4	Landfill liners	1
5	Management of leachate and landfill gas	2
6	Landfill bioreactor	1
7	Dumpsite Rehabilitation	1

21CE6702	REMOTE SENSING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Surveying I & II

Objectives

1. To familiarize about the basic principles of remote sensing
2. To acquire knowledge about the motion of remote sensing satellites in the space
3. To expose the various types of sensors used for remote sensing
4. To gain knowledge about the generation of satellite data products

UNIT I	INTRODUCTION TO REMOTE SENSING	9

Remote Sensing - Definition - Components - Electromagnetic Spectrum – Basic wave theory – Particle theory – Stefan Boltzman law - Wien's-Displacement Law - Effects of Atmosphere-Scattering -Atmospheric window- Energy interaction with surface features – Spectral reflectance of vegetation, soil and water.

UNIT II	PLATFORMS	9

Orbit elements – Types of orbits – Motions of planets and satellites – Launch of space vehicle – Types and characteristics of different remote sensing platforms – sun synchronous and geo synchronous satellites.

UNIT III	OPTICAL SENSORS	9

Classification of remote sensors – resolution concept - Spectral, Radiometric and temporal resolution – imaging mode – photographic camera – opto-mechanical scanners – pushbroom and whiskbroom cameras – Panchromatic, multi spectral , hyperspectral scanners – geometric characteristics of scannerimagery - Earth resource satellites operating with optical sensors-Landsat, SPOT, IRS, WorldView

UNIT IV	PHOTOGRAMMETRY	9

Geometric elements of a vertical photograph – Ortho photos & Flight planning - Stereoscopic plotting instruments

UNIT V	IMAGE INTERPRETATION	9

Elements of visual image interpretation – concepts of digital image processing image Rectification and Restoration – Image enhancement & Image classification – Application of Remote sensing in Civil Engineering.

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Identify the basic remote sensing concepts and its characteristics
CO2: Acquires knowledge about various remote sensing platforms
CO3: Understand the characteristics of different types of remote sensors
CO4: Implement the photogrammetric concepts and fundamentals of Air photo Interpretation
CO5: Interpret and analyze the image

Text Books

1. Lillesand T.M., and Kiefer,R.W. Remote Sensing and Image interpretation, VI edition of John Wiley & Sons-2015.
2. 2. John R. Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective, 4th Edition, 2015.
3. AnjiReddy.M., ―Remote Sensing and Geographical information systems‖, BS Publications 2013.

Reference Books

1. Wolf, P.R., ―Elements of Photogrammetry with Applications in GIS‖, Mc.Graw- Hill International Book Company, 4th ed., 2014.
2. Charles Elachi and Jakob J. van Zyl , Introduction To The Physics and Techniques of Remote Sensing , Wiley Series in Remote Sensing and Image Processing, 2nd edition, 2006

Web Resources

1. https://nptel.ac.in/courses/105108077

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2	3	3		3		3		3	3	3	3
2				3	3		3					3		
3	2			3	3		3					3	3	
4					3		3		3		3	2	3	2
5		3	2	3	3		3	3			3	2	3	2

BLOOMS LEVEL ASSESSMENT PATTERN

Blooms Category	Cat 1	Cat 2	Fat 1	Fat 2	End Sem exam
Remember	50	45	50	50	45
Understand	50	50	50	50	50
Apply		15			15
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain electromagnetic energy with earth surface features in terms of reflected transmitted and absorbed energy.
2. Briefly explain the components of real remote sensing system

COURSE OUTCOME 2:

1. Write a brief note on Geo-Stationary orbit, Sun-Synchronous and polar orbit
2. Give a detailed specification and characteristics on meteorological satellites.

COURSE OUTCOME 3:

1. Describe the resolution concepts of satellite sensors
2. Define radiometer and enumerate the working principle of a long track and across multiple spectral scanners with neat sketch.

COURSE OUTCOME 4:

1. Make an elaborate note on photo printing process followed for making aerial photos.
2. The length of line AB and the elevation of its endpoints, A and B, are to be determined from a stereopair containing images a and b. The camera used to take the photographs has a 152.4-mm lens. The flying height was 1200 m (average for the two photos) and the air base was 600 m. The measured photographic coordinates of points A and B in the"flight line" coordinate system are x_a =54.61 mm, x_b = 98.67 mm, y_a = 50.80 mm, y_b =-25.40 mm, x'_a=-59.45 mm, and x'_b = - 27.39 mm. Find the length of line AB and the elevations of A and B.

COURSE OUTCOME 5:

1. What are the methods that can be used for the multispectral classification of images? Discuss.
2. Explain the digital image processing of satellite imageries for data interpretation.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION TO REMOTE SENSING		
1	Remote Sensing	1
2	Components	1
3	Electromagnetic Spectrum	1
4	Basic wave theory	1
5	Particle theory	1
6	Effects of Atmosphere	1
7	Scattering	1
8	Energy interaction with surface features	1
9	Spectral reflectance of vegetation, soil and water.	1
Unit II PLATFORMS		
1	Orbit elements	1
2	Types of orbits	2
3	Motions of planets and satellites	1
4	Launch of space vehicle	1
5	Types and characteristics of different remote sensing platforms	2
6	sun synchronous and geo synchronous satellites.	2
Unit III OPTICAL SENSORS		
1	Classification of remote sensors – -	1

2	resolution concept - Spectral, Radiometric and temporal resolution	1
3	imaging mode	1
4	photographic camera	1
5	opto-mechanical scanners	1
6	pushbroom and whiskbroom cameras	1
7	Panchromatic, multi spectral , hyperspectral scanners	1
8	geometric characteristics of scanner imagery	1
9	Earth resource satellites operating with optical sensors- Landsat, SPOT, IRS, WorldView	1
Unit IV PHOTOGRAMMETRY		
1	Geometric elements of a vertical photograph	3
2	Ortho photos & Flight planning	3
3	Stereoscopic plotting instruments	3
Unit V IMAGE INTERPRETATION		
1	Elements of visual image interpretation	1
2	concepts of digital image processing	1
3	image Rectification	2
4	image Restoration	2
5	Image enhancement & Image classification	1
6	Application of Remote sensing in Civil Engineering.	2

21CE6703	CONSTRUCTION MANAGEMENT	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Construction techniques
- Highway Engineering

Objectives

1. To provide techniques to develop personal skills of practical use in the Managementand implementation of Civil Engineering projects
2. To know the Management techniques, the development of personal, interpersonaland Project Management skills
3. To know the project management skills
4. To provide a fundamental of understanding of the social, economic, resourcemanagement within which the Construction Project takes place.

UNIT I	PRINCIPLES OF MANAGEMENT	9

Definition – Importance – Functions of Management – Relevance to government and Quasi Government departments – Private Contractors – Contracting firms – Organizational structure – Basics of Green Building Concepts.

UNIT II	CONSTRUCTION PLANNING AND LABOUR WELFARE	9

Collection of field data – Preliminary estimates – Approval and sanction of estimates – Budget provisions – Scheduling methods - Relationships between management and labour problems – Labour legislations – Minimum Wages act – Industrial Psychology – Safety procedures in construction – MS Project Application.

UNIT III	MANAGEMENT TECHNIQUES	9

Concepts of Network – Network methods CPM/PERT – Cost control –Principles – Control by graphical representation, by bill of quantities and by network analysis.

UNIT IV	EXECUTION OF WORKS AND PROJECT MANAGEMENT	9

Tender- Definition – calling for tenders – tender documents – submission of tenders – processing of tenders – negotiations and settlement of contracts. Contract system – types of contracts – specifications, documents, procedures, conditions, takes, law of constructions and Legal implications and penalties.

UNIT V	ACCOUNTS, STORES AND COST EFFECTIVE SYSTEMS	9

Measurements of work – Checking – Types of bills – Mode of payment – Claims – Banking settlements – Types of accounts - Cash book – Storing – Maintenance Inspection - Inventories – Transfer of surplus and accounting of shortage stores – Procedures adopted in PWD and CPWD - Environment friendly and cost effective Building Technologies

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test	Formative Assessment Test	End Semester Exams

(30 Marks)	(10 Marks)	(60 Marks)
3. Descriptive written exam	5. Assignments 6. Quiz	3. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1 : Know about contracts and organizational structure
CO2 : Study the acts and safety aspects.
CO3 : Learn graphical representation and networks.
CO4 : Become a skilled at tenders and report preparation
CO5 : Trained to make out the bills and accounts

Text Books

1. Seetharaman, S., —Construction Engineering and Management||, Umesh Publications, Delhi, 2008.
2. Sengupta, B and Guha, H., —Construction Management and Planning||, Tata McGraw-Hill Co.,1998.
3. J.L. Sharma.||Construction Management and accounts||, Satya Publications, 2010

Reference Books

1. Sanga Reddy, S., and Meyyappan, PL., Construction Management, Kumaran Publications, Coimbatore, 1995.
2. Subramaniam, —Construction Management||, Anuradha Agencies, 2010.
3. Joseph L.Massie, —Essentials of Management||, Prentice Hall of India, 2009.

Web Resources

1. https://nptel.ac.in/courses/105103093/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						3		3			3	3		
2			3		2	3	3			3		3		
3	2				3					3				
4						1				3	3	3		
5										3	3			

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember					
Understand	100	100	100	100	100

Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1.List out the names of organizational structure.

2.Explain the various management theories.

COURSE OUTCOME 2:

1.What are the functions of construction management and give its applications?

2.Give the salient features of contract document.

COURSE OUTCOME 3:

1.List out the various network techniques in construction management.

2.What are the different between CPM and PERT.

COURSE OUTCOME 4:

1.Explain the different laws relating to wages.

2.Give the steps involved in any one of the resource allocation methods.

COURSE OUTCOME 5:

1.Explain the different costs involved in material management for material, labour and expenses.

2.Explain legal and financial aspects of accidents in construction.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - PRINCIPLES OF MANAGEMENT		
1	Definition	1
2	Importance	1
3	Functions of Management	1

4	Relevance to government and Quasi Government departments	1
5	Private Contractors	1
6	Contracting firms	1
7	Organizational structure.	1
8	Basics of Green	1
9	Building Concepts	1
Unit II CONSTRUCTION PLANNING AND LABOUR WELFARE		
1	Collection of field data	1
2	Preliminary estimates	1
3	Approval and sanction of estimates	1
4	Budget provisions – Scheduling methods	1
5	Relationships between management and labour problems	1
6	Labour legislations	1
7	Minimum Wages act - Industrial Psychology	1
8	Safety procedures in construction	1
9	MS Project Application.	1
Unit III MANAGEMENT TECHNIQUES		
1	Concepts of Network	1
2	Network methods CPM	1
3	Network methods PERT	1
4	Cost control	1
5	Principles	1
6	Control by graphical representation	1
7	Bill of quantities	1
8	Network analysis.	1
9	Bill of quantities and by network analysis.	1

Unit IV EXECUTION OF WORKS AND PROJECT MANAGEMENT		
1	Tender- Definition – calling for tenders	1
2	Tender documents – submission of tenders	1
3	Processing of tenders	1
4	Negotiations and settlement of contracts.	1
5	Contract system	1
6	Types of contracts	1
7	Specifications, documents,	1
8	Procedures, conditions,	1
9	Law of constructions and Legal implications and penalties.	1
Unit V ACCOUNTS, STORES AND **COST EFFECTIVE SYSTEMS**		
1	Measurements of work – Checking	1
2	Types of bills – Mode of payment	1
3	Claims – Banking settlements	1
4	Types of accounts - Cash book – Storing	1
5	Maintenance Inspection - Inventories Technologies	1
6	Transfer of surplus and accounting of shortage stores	1
7	Procedures adopted in PWD and CPWD	1
8	Environment friendly construction	1
9	Cost effective Building	1

21CE6704	TRAFFIC ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Construction techniques
- Highway Engineering

Objectives

1. To understand the concepts of transport planning and evaluation techniques.

UNIT I	TRAFFIC STUDIES	9

Road user and Vehicle Characteristics - Traffic Studies -Traffic volume and composition - speed, Headway - Concentration and Delay and Flow principles - Capacity and level of service

UNIT II	TRAFFIC SIGNALS	9

Traffic signals- types- advantages - optimal cycle time - signal setting for an intersection-fixed time signals. Co-ordination of signals- types- area traffic control - delay at signalized intersection

UNIT III	TRAFFIC ENGINEERING AND CONTROL	9

Review of various traffic surveys - traffic Studies-statistical methods - traffic engineering and their applications – distributions - sampling theory - significance testing - regression and correlation intersection design-principles - various available alternatives - rotary design – roundabouts

UNIT IV	ACCIDENTS AND ROAD SAFETY	9

Accident – causes - reporting system - types of accidents - recording system- analysis and preventive measures – Street lighting; Accident cost - alternative methodologies for calculation – modeling – collision diagram-road safety- road users -awareness- road users cost.

UNIT V	TRAFFIC SYSTEM MANAGEMENT	9

Traffic system management -various measures – scope - relative merits and demerits. Highway capacity - passenger car units (PCU) - level of service - factor affecting capacity -level of service-influence of mixed traffic.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Written Test	MCQ	Written Test

Outcomes

Upon completion of the course, the students will be able to:

CO604.1 Analyse traffic problems and plan for traffic systems various uses
CO604.2 Plan and design the traffic signal duration
CO604.3 Practice the traffic engineering and practice the control measures.
CO604.4 Analyse the causes and report the accident
CO604.5 Manage the traffic congestion using the available management measures.

Text Books

1. Kadiyali.L.R. "Traffic Engineering and Transportation Planning", Khanna Publishers, 2014.
2. Subhash Sa3ena, "A Course in Traffic Engineering and Design", Dhanpat Rai & Sons, 2010

Reference Books

1. S.K.Sharma, "Principles, Practice and design of highway Engineering", S.Chand& Co Ltd, New Delhi,
1998.
2. S.K. Khanna & E.G. Justo, Highway Engineering, Nemchand Brothers, Roorkee, 1998.
3. PratabChraborthy&Animesh Das, Principles of Transportation Engineering, Tata McGraw Hill Co,
2004

Web Resources

1. https://nptel.ac.in/courses/105101008

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2	2	1	-	-	1	1	1	-	2		
2	3	2	3	2	1	-	-	1	1	1	-	2		
3	3	3	2		1	-	-	1	1	1	-	2		
4	3	2	3	2	1	-	-	1	1	1	-	2		
5	3	3	2	3	1	-	-	1	1	1	-	2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember					
Understand	30	20	20	20	20
Apply	20	30	30	30	30
Analyze	50	50	50	50	50
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Define Spot Maps
2. Define Collision Diagram

COURSE OUTCOME 2:

1. Write In Detail About Street Lighting
2. Explain various methods of O and D study.

COURSE OUTCOME 3:

1. Enlist purposes of travel time and delay study. Also explain fixed delay and operational delay
2. Explain Rotary Intersection with its advantages and disadvantages

COURSE OUTCOME 4:

1. Explain In Detail About Causes Of Accidents And Accident Studies
2. Write short notes on Safety measures of accidents

COURSE OUTCOME 5:

1. Write In Detail About Non-Motorized Transport
2. Write Short Notes On Public Transport

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - ENERGY PRINCCIPLES		
1	Road user and Vehicle Characteristics -	2
2	Traffic Studies -Traffic volume and composition	2
3	speed, Headway	2
4	Concentration and Delay and Flow principles	1
5	Capacity and level of service	1
Unit II TRAFFIC SIGNALS		
1	Traffic signals- types- advantages	2
2	optimal cycle time	2
3	signal setting for an intersection-fixed time signals.	2
4	Co-ordination of signals- types- area traffic control	1

5	delay at signalized intersection	2
Unit III TRAFFIC ENGINEERING AND CONTROL		
1	Review of various traffic surveys - traffic Studies-statistical methods	2
2	traffic engineering and theirapplications	3
3	distributions - sampling theory - significance testing - regression and correlationintersection	2
4	design-principles - various available alternatives - rotary design – roundabouts	2
Unit IV ACCIDENTS AND ROAD SAFETY		
1	Accident – causes -reporting system - types of accidents	2
2	recording system- analysis and preventive measures.	2
3	Accident cost - alternative methodologies for calculation	3
4	modelling-collision diagram	2
5	Roadsafety- road users -awareness- road users' cost	1
Unit V TRAFFIC SYSTEM MANAGEMENT		
1	Traffic system management -various measures – scope - relative merits and demerits.	1
2	Highway capacity - passenger car units (PCU) -	2
3	level of service - factor affecting capacity -level of service-	2
4	influence of mixed traffic	2

21CE6705	SAFETY IN CONSTRUCTION	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Construction techniques and practices
- Construction Materials

Objectives

1. To understand the reasons of accidents & hazards.
2. To identify method of safety against construction accidents.
3. To provide exposure on obligations for the duration of contract.
4. To implement plan for safety technology for the protection of workers.
5. To know the different way of health practice

UNIT I	INTRODUCTION TO CONSTRUCTION ACCIDENTS AND SAFETY PROGRAMME	9

Accidents and causes - Accident prevention - Definition and principles – Concept of safety - Evolution of modern safety concept-Safety policy -Safety Organization -line and staff -functions for safety-Safety Committee –Accident management.

UNIT II	OCCUPATIONAL HEALTH PRACTICE	9

Noise -noise exposure regulation -occupational damage -risk factors -permissible exposure limit. Ionizing radiation –types -effects -monitoring instruments -control measures –Dust hazards - Methods of Control, pre employment and post-employment medical examinations.

UNIT III	FIRE ENGINEERING AND EXPLOSION CONTROL	9

Fire chemistry –Dynamics of fire behavior –Fire properties of solid, liquid and gas –Fire spread – Toxicity of products of combustion. Building evaluation for fire safety –Fire load –Fire resistance materials and fire testing –Structural Fire protection –Exits and egress. Statutory Rules and Techniques of fire fighting -Indian Explosive acts and rules –Techniques of fire fighting and demonstration.

UNIT IV	SAFETY IN CONSTRUCTION	9

General safety consideration –analyzing construction jobs for safety –Contract document –Safety certificate for statutory authorities for old building and construction. Safety in Erection and closing operation - Construction materials –Specifications – suitability – Limitations. Safety in typical civil structures –Dams-bridges-water Tanks-Retaining walls-Critical factors for failure-Regular Inspection and monitoring.

UNIT V	SAFETY IN MATERIAL HANDLING	9

General safety consideration in material handling - Ropes, Chains, Sling, Hoops, Clamps, Arresting gears. Selection, operation and maintenance of Industrial Trucks – Mobile Cranes – Tower crane – Check list - Competent persons.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)

4. Descriptive written exam	7. Assignments 8. Quiz	4. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1 : Identify the correct method of managing accidents by analysing the actual situations.
CO2 : Implement appropriate safety programmes at the site to make accident free construction.
CO3 : Adopt the contractual obligations which are essential in the site.
CO4 : Monitor safety precautions using technology.
CO5 : Realize the occupation al hazards and to take remedial actions.

Text Books

1. Krishnan N.V. —Safety Management in Industry‖ Jaico Publishing House, Bombay, 1997
2. Jimmy W. Hinze, —Construction Safety‖, Pearson Education, Inc., 2006.
3. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, Construction Safety and Health Management, Prentice Hall Inc., 2001

Reference Books

1. Gupta R.S., Handbook of Fire Technology, Orient Longman, Bombay, 1997.
2. Darryl C. Hill, —Construction Safety Management and Engineering,2nd ed., ‖ American Society of Safety Engineers, 2014.
3. David L. Goetsch, Stephen Beach, —Construction Safety and Health‖, 2nd ed., Pearson Education, Inc., 2012.
4. The Factories Act, 1948, Department of Labour, Government of India.
5. Tamilnadu Factory Rules, 1950, Department of Inspectorate of factories, Tamilnadu .

Web Resources

1. https://nptel.ac.in/courses/105104161

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-	3	-	-	-	3	-	-	-	3	3		
2	-	-	3	-	2	-	-	-	2	-	3	3		
3	-	-	3	-	-	-	3	-	-	2	-	3		
4	-	-	-	-	3	-	3	-	-	-	2	3		
5	-	-	-	-	-	-	3	3	3	-	3	-		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM

Remember					
Understand	100	100	100	100	100
Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. What are the most important safety procedures you enforce on a construction site?

2. What is the proper procedure for investigating a construction accident?

COURSE OUTCOME 2:

1. How would you handle a situation where a construction worker refuses to follow safety procedures?

2. Provide an example of a time when you used your communication skills to resolve a conflict between two co-workers.

COURSE OUTCOME 3:

1. If a construction worker complained of feeling sick, how would you determine if they were fit to continue working?

2. What would you do if you noticed a construction worker using faulty equipment?

COURSE OUTCOME 4:

1. How well do you perform in high-pressure situations?

2. When inspecting a structure, what is the most important thing you look for?

COURSE OUTCOME 5:

1. We want to ensure our construction sites are as environmentally friendly as possible. How would you encourage eco-friendly practices among workers?

2. Describe your experience with using construction equipment.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION TO CONSTRUCTION ACCIDENTS AND SAFETY PROGRAMME		
1	Accidents and causes	1
2	Accident prevention	1
3	Definition and principles	1
4	Concept of safety	1
5	Evolution of modern safety concept	1
6	Safety policy	1
7	Safety Organization -line and staff	1
8	functions for safety-Safety Committee	1
9	Accident management.	1
Unit II OCCUPATIONAL HEALTH PRACTICE		
1	Noise -noise exposure regulation	1
2	Occupational damage	1
3	Risk factors	1
4	Permissible exposure limit.	1
5	Lonizing radiation	1
6	Types -effects -monitoring instruments	1
7	Control measures –Dust hazards	1
8	Methods of Control, pre employment and post	1
9	Employment medical examinations.	1
Unit III FIRE ENGINEERING AND EXPLOSION CONTROL		
1	Fire chemistry	1
2	Dynamics of fire behavior	1
3	Fire properties of solid, liquid and gas –Fire spread	1
4	Toxicity of products of combustion.	1

5	Building evaluation for fire safety –Fire load	1
6	Fire resistance materials and fire testing –Structural Fire protection	1
7	Exits and egress. Statutory Rules and Techniques of fire fighting	1
8	Indian Explosive acts and rules	1
9	Techniques of fire fighting and demonstration.	1
Unit IV SAFETY IN CONSTRUCTION		
1	General safety consideration	1
2	Analyzing construction jobs for safety –Contract document	1
3	Safety certificate for statutory authorities for old building and construction.	1
4	Safety in Erection and closing operation - Construction materials	1
5	Specifications – suitability Limitations.	1
6	Safety in typical civil structures	1
7	Dams-bridges-water Tanks	1
8	Retaining walls-Critical factors for failure	1
9	Regular Inspection and monitoring.	1
Unit V SAFETY IN MATERIAL HANDLING		
1	General safety consideration in material handling	1
2	Ropes, Chains, Sling,	1
3	Hoops, Clamps,	1
4	Arresting gears. Selection,	1
5	operation and maintenance of Industrial Trucks	1
6	Mobile Cranes	1
7	Tower crane	1
8	Check list	1
9	Competent persons.	1

21CE6706	WATER RESOURCES SYSTEMS ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Environmental Science and Engineering
- Water supply Engineering

Objectives

1. To impart knowledge on spatial and temporal distribution of water available in any region.
2. To disseminate the knowledge on hydrologic estimates for river and reservoir management.
3. To emphasize the need for water resources planning and management.

UNIT I	INTRODUCTION	9

Climate and weather- meteorological and hydrological parameters - hydrologic cycle - water-budget equation - water resources survey - consumptive and non-consumptive water use - water scarcity and its impacts - water resources planning - watershed management - national water policy.

UNIT II	FUNDAMENTALS OF HYDROLOGY	9

Types of precipitation - measurement of rainfall - rain-gauge density - optimum rain-gauge network design - frequency analysis of rainfall data - losses from precipitation - interception and depression storage - estimation of evaporation and transpiration - measurement of infiltration – infiltrationindices - effective rainfall - estimation of runoff.

UNIT III	ANALYSIS OF STREAM FLOW	9

Components of stream flow - stream gauging - stage-discharge rating curve - selection of site for stream gauging station - hydrograph analysis - hydrograph separation - unit hydrograph-S-curve hydrograph –unithydrograph of different deviations - synthetic unit hydrograph - methods for peak discharge estimation - frequency analysis of stream flow data.

UNIT IV	RESERVOIR MANAGEMENT	9

Single purpose and multipurpose reservoir - determination of storage capacity and yield – strategies for reservoir operation - reservoir reliability - methods of flood control - flood forecasting and warning.

UNIT V	GROUNDWATER HYDROLOGY	9

Types of geologic formations and aquifers - aquifer properties - Darcy's law - transmissibility – well hydraulics - steady state flow equations for confined and unconfined aquifers - cavity wells - yield of a well - construction of open wells and bore wells - well shrouding and well development.

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Infer the fundamentals of hydrological parameters and need for water conservation.
CO2: Assess the variations in distribution of rainfall, runoff, infiltration and evapo-transpiration.
CO3: Demonstrate development and applications of hydrographs and frequency analysis from stream flow data.
CO4: Attribute strategies for sustainable reservoir operation and flood control using reliability, economic analysis and flood routing techniques.
CO5: Identify methods of groundwater assessment and extraction including factors affecting groundwater yield.

Text Books

1. Raghunath .H.M, *"Hydrology"*, New Age International Publishers, New Delhi, 2007.
2. Santhosh Kumar Garg, *"Irrigation Engineering and Hydraulic Structures"*, Khanna Publishers, 2000.
3. Asawa .G.L, *"Irrigation and Water Resources Engineering"*, New Age International Publishers, New Delhi, 2005.
4. Sharma .R.K, *"Irrigation Engineering and Hydraulic Structures"*, Oxford and IBH Publishing Company, New Delhi, 2002.

Reference Books

1. Raghunath .H.M, *"Ground Water Hydrology"*, Wiley Eastern Ltd., Second reprint, 2000.
2. VenTeChow, D.R. Maidment and L.W. Mays, Applied Hydrology, 1st Edition, McGraw Hill,NewYork,ISBN: 0071001743,1998.
3. K.N. Duggal, J.P. Soni, Elements of Water Resources Engineering, New Age International Pvt Ltd Publishers, New Delhi, ISBN: 8122408079, 2008.
4. P. Jaya Rami Reddy, A Textbook of Hydrology,3rd Edition, Tata McGraw Hill, New Delhi,2016, ISBN:9380856040, 2016.

Web Resources

1. http://nptel.ac.in/courses/105104103/
2. http://nptel.ac.in/courses/105105110/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1				1	1							2
2	2	1	1			1	1							2
3	1	2	2											2
4	2	2										2		2
5	2	2				1	1					2		2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember					
Understand	50	50	50	50	50
Apply	50	50	50	50	50
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Define Master Plan in water resources? Explain the scope and aims in detail.
2. Write briefly about water budget and its development plan.

COURSE OUTCOME 2:

1. How will you measure rainfall with Non-Recording type Rain gauge.
2. Write about the factors affecting Evaporation and Transpiration.

COURSE OUTCOME 3:

1. Define Unit Hydrograph. What are theassumptions underlying the Unit Hydrograph theory? Explain uses of Unit Hydrograph.
2. Define hydrograph and factor affecting it.

COURSE OUTCOME 4:

1. Explain how to fixed storage capacity of reservoir.
2. Explain with neat sketch storage zone of a reservoir.

COURSE OUTCOME 5:

1. Describe a method of determining the yield from an open well.
2. What is Darcy's law? What are its limitations? How will you measure the coefficient of permeability of soil?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION		
1	Climate and weather	1
2	meteorological and hydrological parameters	1
3	hydrologic cycle - water-budget equation	2
4	water resources survey - consumptive and non-consumptive water use	2
5	water scarcity and its impacts	1
6	water resources planning	1
7	watershed management - national water policy	1
Unit II FUNDAMENTALS OF HYDROLOGY		
1	Types of precipitation	2
2	measurement of rainfall - rain-gauge density - optimum rain-gauge network design	1
3	frequency analysis of rainfall data - losses from precipitation	1
4	interception and depression storage	1
5	estimation of evaporation and transpiration	1
6	measurement of infiltration – infiltration indices	2
7	effective rainfall - estimation of runoff	1
Unit III ANALYSIS OF STREAM FLOW		
1	Components of stream flow - stream gauging - stage-discharge rating curve	2
2	selection of site for stream gauging station	1
3	hydrograph analysis - hydrograph separation	1

4	unit hydrograph-S-curve hydrograph –unit hydrograph of different deviations	2
5	synthetic unit hydrograph	1
6	methods for peak discharge estimation	1
7	frequency analysis of stream flow data	1
Unit IV RESERVOIR MANAGEMENT		
1	Single purpose and multipurpose reservoir	2
2	determination of storage capacity and yield	2
3	strategies for reservoir operation	2
4	reservoir reliability	1
5	methods of flood control	1
6	flood forecasting and warning	1
Unit V GROUNDWATER HYDROLOGY		
1	Types of geologic formations and aquifers - aquifer properties	2
2	Darcy's law - transmissibility – well hydraulics	2
3	steady state flow equations for confined and unconfined aquifers	2
4	cavity wells - yield of a well	1
5	construction of open wells and bore wells	1
6	well shrouding and well development	1

PROFESSIONAL ELECTIVE III

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/ Domain
1	21CE6707	Railways, Airport and Harbour Engineering	6	3	0	0	3	Transportation
2	21CE6708	Geoinformatics Applications for Civil Engineers	6	3	0	0	3	Geo informatics
3	21CE6709	Industrial Wastes Treatment and Disposal	6	3	0	0	3	Environmental Engineering
4	21CE6710	Air Pollution Management	6	3	0	0	3	Environmental Engineering
5	21CE6711	Housing Planning and Management	6	3	0	0	3	Management
6	21CE6712	Human Rights	6	0	0	3	3	Sociology

21CE6707	RAILWAYS, AIRPORT AND HARBOUR ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Construction materials
- Highway Engineering
- Surveying

Objectives

1. To give exposure to railway planning, geometric design, railway track construction, maintenance.
2. To study the concept of airport planning and design.
3. To understand the different types of structures used in harbour

UNIT I	RAILWAY PLANNING AND DESIGN	9

Significance of Road, Rail, Air and Water transports - 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 railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.

UNIT II	RAILWAY CONSTRUCTION AND MAINTENANCE	9

Earthwork – Stabilization of track on poor soil - Tunneling Methods, drainage and ventilation – Calculation of Materials required for track laying - Construction and maintenance of tracks - Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways.

UNIT III	AIRPORT PLANNING	9

Air transport characteristics-airport classification-airport planning: objectives, components, Site selection typical Airport Layouts - parking and Circulation Area-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations.

UNIT IV	**AIRPORT DESIGN**	**9**

Runway Design: Orientation, Wind Rose Diagram (Problems) - Runway length - Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles - Elements of Taxiway Design - Airport Zones - Passenger Facilities and Services - Runway and Taxiway Markings and lighting.

UNIT V	**HARBOUR ENGINEERING**	**9**

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides - Planning and Design of Harbours: Harbour Layout and Terminal Facilities - Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage -mooring, types of mooring - Inland Water Transport -Wave action on Coastal Structures and Coastal Protection Works.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Plan and design the railway track components.
CO2: Understand about the railway construction and maintenance.
CO3: Plan and design the components of airport.
CO4: Use the techniques for airport runway and taxiway design.
CO5: Plan and design a harbour

Text Books

1. Saxena Subhash C and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi, 2010
2. Khanna S K, Arora M G and Jain S S, "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2012.
3. Bindra S P, "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi, 2013
4. C.Venkatramaiah., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015.

Reference Books

1. Rangwala, "Railway Engineering", Charotar Publishing House, 2013.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2013.
3. Rangwala, "Harbor Engineering", Charotar Publishing House, 2013.
4. Oza.H.P. and Oza.G.H., —A course in Docks & Harbour Engineering||. Charotar Publishing Co., 2013

Web Resources

1. https://nptel.ac.in/courses/105107123

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3				3		3				3	3
2				2	3		3							
3	3		3		3		3		3			3	3	
4	2		3		3				3	2	2	3	2	
5					3				3		3			

BLOOMS LEVEL ASSESSMENT PATTERN

Blooms Category	Cat 1	Cat 2	Fat 1	Fat 2	End Sem exam
Remember	10	10	10	10	10
Understand	50	50	50	50	50
Apply					
Analyze	40	40	40	40	40
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Enumerate the concept of grade compensation and also explain the basic formulas used in grade compensation.
2. If A 8° curved track diverges from a main track of 5° in an opposite direction in the layout of B.G Yard. Calculate the Super-elevation and Speed of a branch line. If the maximum Speed permitted on the main line is 45 KMPH

COURSE OUTCOME 2:

1. Explain the various types of Level crossings and remedial measures. Give all in detail
2. Draw a neat diagram of simple right hand turnout and Show its various components. Explain the Working Principal of Turnout

COURSE OUTCOME 3:

1. Discuss in detail the factors affecting the choice of the Selection of Site for an Airport
2. What is meant BY Airport Zoning. Discuss all in Detail

COURSE OUTCOME 4:

1. Explain the various Aircraft parking Systems involved in Airport. Give all in detail
2. Explain the various types of lightings involved in Airport. Give all in detail

COURSE OUTCOME 5:

1. Enumerate the various types of Harbors with neat Sketch
3. Explain the layout concept on harbor With neat Sketch

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - RAILWAY PLANNING AND DESIGN		
1	Significance of Road, Rail, Air and Water transports	1
2	Elements of permanent way	2
3	Selection of gauges	1
4	Track Stress, coning of wheels, creep in rails, defects in rails	2
5	Geometric design of railways	2
6	Points and Crossings	1
Unit II RAILWAY CONSTRUCTION AND MAINTENANCE		
1	Earthwork	1
2	Stabilization of track on poor soil	1
3	Tunneling Methods, drainage and ventilation	2
4	Calculation of Materials required for track laying	1
5	Construction and maintenance of tracks	1
6	Railway stations and yards and passenger amenities	1
7	Urban rail	2

Unit III AIRPORT PLANNING		
1	Air transport characteristics	1
2	airport classification	1
3	airport planning	2
4	parking and Circulation Area	2
5	economic characteristics of the Catchment area	1
6	criteria for airport site selection	1
7	ICAO stipulations.	1
Unit IV AIRPORT DESIGN		
1	Runway Design	1
2	Wind Rose Diagram (Problems)	1
3	Problems on basic and Actual Length	1
4	Geometric design of runways	1
5	Elements of Taxiway Design	1
6	Configuration and Pavement Design Principles	1
7	Airport Zones	1
8	Passenger Facilities and Services	1
9	Taxiway Markings and lighting	1
Unit V HARBOUR ENGINEERING		
1	Definition of Basic Terms	1
2	Design of Harbours	2
3	Coastal Structures	2
4	Mooring	1
5	Inland Water Transport	1
6	Wave action on Coastal Structures	1
7	Coastal Protection Works.	1

21CE6708	GEOINFORMATICS APPLICATIONS FOR CIVIL ENGINEERS	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Geographic information system

Objectives

1. To solve the Civil Engineering problems with the help of Geoinformatics technique.

UNIT I	LAND RESOURCE MANAGEMENT	6

Total Station and GPS Surveys – Topographic and Bathymetric Surveys – Cadastral Information – Soil and Land Use Surveys - Land Information System (LIS) – Real Estate Information System

UNIT II	STRUCTURAL STUDIES	6

Deformation studies of deflection - Dam deformation - structural movement - Pavement yield - shifting sand-bank and shoreline – Landslide Risk Analysis – Case studies

UNIT III	SOIL CONSERVATION AND MANAGEMENT	9

Soil survey interpretation and mapping - impact of agricultural and industrial activity on soil properties - soil erosion - factors influencing soil erosion - modeling soil characteristics using satellite data – case studies - soil degradation assessment using Remote Sensing and GIS - Land reclamation studies

UNIT IV	URBAN AND TRANSPORTATION MANAGEMENT	12

Monitoring Urban Growth through Remote Sensing - Geo-demographic Analysis – Property Market Analysis Urban Renewal - traffic analysis - accident analysis - site suitability analysis for transport infrastructure case study –transportation databases: creation and maintenance - Vehicle routing – Highway maintenance system

UNIT V	WATER RESOURCES PLANNING AND MANAGEMENT	12

Location of storage/diversion works – capacity curve generation – sediment yield - modelling of catchments – Delineation of watershed - Rainfall – Runoff modelling –Water quality mapping and monitoring – Flood Risk Zoning - Flood damage assessment – Flood Modelling - Assessment of droughts and mitigation

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Get knowledge about the land resource management.
CO2: Study structural deformation and movement.
CO3: Model soil characteristics, soil degradation assessment and management.
CO4: Monitor urban growth and management of transport infrastructure.
CO5: Model catchments and management of water resources.

Text Books

1. Basudeb Bhatta, 'Remote Sensing and GIS', Second edition, Oxford University Press 2011.
2. Lo.C.P., Albert K.W.Yeung, Concepts and Techniques of Geographic Information Systems, Second edition, PHI Learning Private Limited, Delhi, 2014.

Reference Books

1. Andrew N. Rencz, Manual of Remote Sensing: Remote Sensing for Natural Resource Management and Environmental Monitoring, John Wiley & Sons Inc, April 2004
2. Rashed, Tarek; Jürgens, Carsten (Eds.), Remote Sensing of Urban and Suburban Areas, Springer, 1st Edition. 2010.
3. Harvey J. Miller, Shih-Lung Shaw, Geographic Information Systems for Transportation – Principles and Applications, Oxford University Press, 2001.
4. Gert A. Schulitz Edwin T. Engman, Remote Sensing in hydrology and Water Management, Springer - verlag Berlin Heidelberg Germany - 2000.

Web Resources

1. https://archive.nptel.ac.in/courses/105/107/105107206
2. https://nptel.ac.in/courses/105105110

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2										1	2	1
2	3		3		3							3	2	1
3	3	2	3		3							3	2	1
4	3	3											2	1
5	3	2	1		2							3	2	1

21CE6709	INDUSTRIAL WASTES TREATMENT AND DISPOSAL	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Environmental sciences
- Water Supply Engineering

Objectives

1. To know the various processes of wastewater treatment and the engineering requirements for that treatment facilities.
2. To provide adequate knowledge about phenomena of atmospheric environment and treatment, sources, characteristics and treatment processes of various types of industries.
3. This subject deals with the polluting potential of major industries and methods of control the pollution.

UNIT I	INTRODUCTION	9

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health– Environmental legislations related to prevention and control of industrial effluents and hazardous wastes– Pollution Control Boards.

UNIT II	WASTE MANAGEMENT SYSTEM	9

Waste management approach – Waste Audit – Volume and strength reduction – material and process modifications – Recycle, reuse and by-product recovery – Applications.

UNIT III	POLLUTION FROM MAJOR INDUSTRIES	9

Sources & their Characteristics, waste treatment flow sheets for selected industries such as textiles, tanneries, dairy, sugar, paper, distilleries, steel plants, refineries, fertilizer, and thermal power plants – wastewater reclamation concepts.

UNIT IV	INDUSTRIAL WASTE TREATMENT TECHNIQUES	9

Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption – Removal of dissolved inorganic solids – Combined treatment of industrial and municipal wastes – Residue management – Dewatering

UNIT V	HAZARDOUS WASTE MANAGEMENT	9

Hazardous wastes types of Wastes – Sources of wastes / Methods of Handling - Physio chemical treatment – solidification – incineration – Secured land fills

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Written Test	MCQ	Written Test

Outcomes

Upon completion of the course, the students will be able to:

CO606-1.1 Describe the types, characteristics, effects of industrial waste and legislations. (K2)
CO606-1.2 Overview of the concepts of cleaner production (K2)
CO606-1.3 Summarize the sources, characteristics and treatment of waste from major industries (K2)

CO606-1.4 Discuss various new techniques for collection, recycling & residue management (K3) CO606-1.5 Identify various treatments and management of hazardous waste (K2)
Text Books
1.M.N.Rao & A.K.Dutta —Wastewater Treatment‖, Oxford IBH Publication, 1995. 2.Eckenfelder W.W Jr.,—Industrial Water Pollution Control‖,McGrawHill Book Company, New Delhi, 2000. 3.Manivasakam N, —Industrial Effluents‖, Sakthi Publications, Coimbatore, 1997
Reference Books
1. T.T.Shen,, —Industrial Pollution Prevention‖, Springer publications, 1999 2. R.L.Stephenson & J.B.Blackburn Jr., Industrial Wastewater Systems Hand book, Lewis Publishers, New York, 1998 H.M.Freeman, "Industrial Pollution Prevention Hand Book", McGraw-Hill Inc., New Delhi, 1995.
Web Resources 1. https://nptel.ac.in/courses/105/106/105106056/ 2. https://nptel.ac.in/courses/105/105/105105178/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2					3					1	2	1
2	1		3		3		3					3	2	1
3	3	2	3		3		3				3	3	2	1
4	1	3					3				2		2	1
5	1	2	1		2		3				3	3	2	1

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	50	50	50	50	50
Apply	30	30	30	30	30
Analyze					
Evaluate					

Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

3. Explain in detail about the different sources of Industrial waste waters.
4. What are the factors affecting self purification of polluted streams? Give suggestions to control.

COURSE OUTCOME 2:

3. Explain the inplant control measures to reduce volume of the industrial waste water.
4. Enumerate the basic theories of Industrial wastewater management and Explain the strength reduction.

COURSE OUTCOME 3:

1. Explain with neat flow sheet manufacturing process of sugar from sugar industry. Write down the characteristics of the effluent.
2. Discuss with the flow sheet treatment given to the pulp and paper industry effluent.

COURSE OUTCOME 4:

5. What is neutralization? Is it necessary for industrial waste treatment? Justify your answer. What are the methods of neutralization?
6. Write short note on dewatering of sludge.

COURSE OUTCOME 5:

5. Explain the storage and handling of hazardous waste.
6. Discuss about the factors affecting the site selection for landfilling? Give the advantages and disadvantages of landfilling.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION		
1	Types of industries and industrial pollution – Characteristics of industrial wastes	2
2	Population equivalent – Bioassay studies	2
3	effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health	2

4	Environmental legislations related to prevention and control of industrial effluents and hazardous wastes	2
5	Pollution Control Boards.	1
Unit II DISPERSION OF POLLUTANTS		
1	Waste management approach	1
2	Waste Audit	1
3	Volume and strength reduction	2
4	material and process modifications	3
5	Recycle, reuse and by-product recovery- Applications.	2
UNIT III POLLUTION FROM MAJOR INDUSTRIES		
1	Sources & their Characteristics	1
2	waste treatment flow sheets for selected industries such as textiles, tanneries	2
3	waste treatment flow sheets for selected industries such as dairy, sugar, paper, distilleries, steel plants, refineries,	3
4	Waste treatment flow sheets for selected industries such as fertilizer, and thermal power plants – wastewater reclamation concepts.	3
UNIT IV INDUSTRIAL WASTE TREATMENT TECHNIQUES		
1	Equalisation – Neutralisation	2
2	Removal of suspended and dissolved organic solids	2
3	Chemical oxidation – Adsorption – Removal of dissolved inorganic solids	2
4	Combined treatment of industrial and municipal wastes	2
5	Residue management – Dewatering	1
UNIT V HAZARDOUS WASTE MANAGEMENT		
1	Hazardous wastes types of Wastes – Sources of wastes	1
2	Methods of Handling	3
3	Physio chemical treatment - solidification – incineration	3
4	Secured land fills	2

21CE6710	AIR POLLUTION MANAGEMENT	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Environmental sciences

Objectives

1. To study about the characteristics and effects of air and noise pollution and the methods of controlling the same.
2. To know about source inventory and control mechanism

UNIT I	SOURCES AND EFFECTS OF AIR POLLUTANTS	9

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Analysis of pollutants – Principles.

UNIT II	DISPERSION OF POLLUTANTS	9

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants.

UNIT III	AIR POLLUTION CONTROL	9

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion.

UNIT IV	AIR QUALITY MANAGEMENT	9

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Air quality.

UNIT V	NOISE POLLUTION	9

Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Written Test	MCQ	Written Test

Outcomes

Upon completion of the course, the students will be able to:

CO606-1.1 Understand about nature and characteristics of air pollutants.
CO606-1.2 Identify the basic elements of atmosphere and its stability.
CO606-1.3 Design stacks and particulate air pollution control devices to meet applicable standards.
CO606-1.4 Understand the basic concepts of air quality management.
CO606-1.5 Identify, formulate and solve air and noise pollution problems

Text Books

1. Anjaneyulu, D., —Air Pollution and Control Technologies||, Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
3. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata McGraw Hill, New Delhi, 1996.

Reference Books
1. Heumann. W.L., "Industrial Air Pollution Control Systems", McGraw Hill, New Yark, 1997. 2. Mahajan S.P., "Pollution Control in Process Industries", Tata McGraw Hill Publishing Company, New Delhi, 1991. 3. Peavy S.W., Rowe D.R. and Tchobanoglous G. "Environmental Engineering", McGraw Hill, New Delhi, 1985. 4. Garg, S.K., —Environmental Engineering Vol. II||, Khanna Publishers, New Delhi, 1998 5. Mahajan, S.P., —Pollution Control in Process Industries||, Tata McGraw Hill, New Delhi, 1991. 6. Thod Godesh, "Air Quality, Lewis India Edition, 2013.
Web Resources 1. https://nptel.ac.in/courses/105105108/ 2. https://nptel.ac.in/content/syllabus_pdf/105105108.pdf 3. https://nptel.ac.in/courses/112101095/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2					3					1		
2	1		3		3		3					3		
3	3	2	3		3		3				3	3		
4	1	3					3				2			
5	1	2	1		2		3				3	3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	50	50	50	50	50
Apply	30	30	30	30	30
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

5. Discuss the global warming pollutants responsible, their sources and impacts.
6. List out the methods for quantitative analysing of air pollutants.

COURSE OUTCOME 2:

5. Explain the factors influencing the atmospheric dispersion of air pollutants.
6. Explain the Gaussian plume model, assumptions made and its limitations.

COURSE OUTCOME 3:

1. Draw the cyclone showing the design proportions and explain its working principle, advantages and limitations.
2. With a neat sketch, explain the principle, construction and working of an electrostatic precipitator.

COURSE OUTCOME 4:

7. Explain the air pollution efforts made in our country.
8. Explain how you will do evaluation of existing ambient air quality conditions and also carrying out impact assessment in an area where EIA is conducted.

COURSE OUTCOME 5:

7. Explain how the noise exposure causes ill effects on human.
8. Explain the noise control methodologies.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - SOURCES AND EFFECTS OF AIR POLLUTANTS		
1	Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution.	2
2	Effects of air pollution on human beings, materials, vegetation, animals	2
3	global warming-ozone layer depletion	1
4	Sampling and Analysis	2
5	Analysis of pollutants – Principles.	2
Unit II DISPERSION OF POLLUTANTS		

1	Elements of atmosphere	1
2	Meteorological factors	2
3	Wind roses – Lapse rate	2
4	Atmospheric stability and turbulence	2
5	Plume rise – Dispersion of pollutants.	2
Unit III AIR POLLUTION CONTROL		
1	Concepts of control – Principles and design of control measures.	2
2	Particulates control by gravitational, centrifugal, filtration, scrubbing.	2
3	Electrostatic precipitation – Selection criteria for equipment.	2
4	Gaseous pollutant control by adsorption, absorption, condensation, combustion.	3
Unit IV AIR QUALITY MANAGEMENT		
1	Air quality standards.	2
2	Air quality monitoring	2
3	Preventive measures - Air pollution control efforts.	2
4	Zoning – Town planning regulation of new industries.	2
5	Air quality.	1
Unit V NOISE POLLUTION		
1	Sources of noise pollution.	1
2	Effects of noise pollution - Assessment	3
3	Standards – Control methods	3
4	Prevention.	2

21CE6711	HOUSING PLANNING AND MANAGEMENT	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Construction techniques
- Construction Materials

Objectives

1. Train the students to have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.
2. The course focuses on cost effective construction materials and methods

UNIT I	INTRODUCTION TO HOUSING	9

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	9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods - Plotted land 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-Government Organizations in 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, Designs of Housing Units (Design Problems) – Housing Project Formulation

UNIT IV	CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS	9

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction - Green building concept- Building Centers – Concept, Functions and Performance Evaluation.

UNIT V	HOUSING FINANCE AND PROJECT APPRAISAL	9

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 of Housing Units (Problems).

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1 : Plan and design the housing projects as per regulations.
CO2 : Design the various housing programme with sustainability concepts

CO3 : Formulate and design the housing layouts by conducting site analysis
CO4 : Evaluate the suitability of various cost effective construction materials.
CO5 : Perform the economic analysis and project appraisal of housing projects

Text Books

1. Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 1997.

Reference Books

1. Wiley- Blackwell, "Neufert Architects" Data, 4th Edition, Blackwell Publishing Ltd, 2012
2. Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8th ed.,Tata McGraw Hill Edition, 2011
3. Walter Martin Hosack, "Land Development Calculations", McGraw Hill 2nd ed., USA 2010
4. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004.
5. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS Habitat, Nairobi, 1994
6. Government of India, National Housing Policy, 1994

Web Resources

1. https://nptel.ac.in/courses/124107001

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		3		3			3						
2	3	3				3	3							2
3		3	3		2			3						
4	3							3	2					
5		3					3	3	3					

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember					
Understand	100	100	100	100	100
Apply					
Analyze					

Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain in detail about salient futures of the national housing policy.
2. What are the various documents to be submitted for approval of building in municipality?

COURSE OUTCOME 2:

1. What are the various Contents and Standards for Housing Program?
2. State any two role played by non-government organization in the housing sector.

COURSE OUTCOME 3:

1. Briefly explain about Site Planning, Design Process, and formation housing project.
2. Give the discuses about site analysis and various elements of site analysis.

COURSE OUTCOME 4:

1. State any two requirements of cost effective building materials.
2. Evaluate different function and performance of any one building center in tamilnadu.

COURSE OUTCOME 5:

1. What is mean project appraisal of housing planning?
2. Briefly explain about type of home loan details for housing planning programme?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION TO HOUSING		
1	Definition of Basic Terms – House, Home,	1
2	Household, Apartments,	1
3	Multi storied Buildings, Special Buildings,	1
4	Objectives and Strategies of National Housing Policies including Slum Housing Policy,	1
5	Principle of Sustainable Housing	1
6	Integrated approach on arriving holding capacity and density norms	1

7	All basic infrastructure consideration	1
8	Institutions for Housing at National,	1
9	State and Local levels.	1
Unit II HOUSING PROGRAMMES		
1	Basic Concepts, Contents and Standards for Housing Programmes	1
2	Sites and Services, Neighborhoods	1
3	Plotted land development programs, Open Development Plots,	1
4	Apartments, Gated communities, Townships, Rental Housing,	1
5	Co-operative Housing & Slum Housing Programmers -	1
6	Slum improvement – Slum redevelopment and Relocation	1
7	Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies,	1
8	Private sector in supply, quality, infrastructure and pricing	1
9	Role of Non-Government Organizations in slum housing.	1
Unit III PLANNING AND DESIGN OF HOUSING PROJECTS		
1	Formulation of Housing Projects	1
2	Land Use	1
3	Soil suitability analysis	1
4	Building Byelaws	1
5	Rules Development Control Regulations	1
6	Site Analysis,	1
7	Layout Design,	1
8	Designs of Housing Units (Design Problems)	1
9	Housing Project Formulation	1
Unit IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS		
1	New Constructions Techniques	1
2	Cost Effective Modern Materials	1

3	Methods of Construction	1
4	Green building concept	1
5	Building Centers	1
6	New techniques Concept,	1
7	Functions and Performance Evaluation.	1
8	Performance Evaluation.	1
9	Modern materials in construction	1
Unit V HOUSING FINANCE AND PROJECT APPRAISAL		
1	Evaluation of Housing Projects for sustainable principles	1
2	Sustainable principles	1
3	Housing Finance,	1
4	Cost Recovery	1
5	Cash Flow Analysis,	1
6	Subsidy and Cross Subsidy	1
7	Public Private Partnership Projects	1
8	Viability Gap Funding	1
9	Pricing of Housing Units (Problems).	1

21CE6712	HUMAN RIGHTS	L	T	P	C
		3	1	0	4

Prerequisites for the course

- NIL

Objectives

1. To sensitize the Engineering students to various aspects of Human Rights

UNIT I	BASIC CONCEPTS	9

Individual,Group,CivilSociety,State,Equality,Justice,HumanValues,Humanity,Virtues, Compassion

UNIT II	HUMAN RIGHTS AND HUMAN DUTIES	9

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT III	SOCIAL STRUCTURE AND PROBLEMS	9

Impact of Social Structure on Human behavior, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization. Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged

UNIT IV	THEORIES OF HUMAN RIGHTS	9

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights. Theories and perspectives of UN Laws – UN Agencies to monitor and compliance. Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V	HUMAN RIGHTS OF DISADVANTAGED PEOPLE	9

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disability persons, including Aged and HIV Infected People Disability persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:
CO1: Understand the basic concepts of human rights **CO2:** Explain the duties and rights of individual and group **CO3**: Analyze various problems in society and attempt to give solutions to eliminate such problems **CO4:** Understand theories related to human rights **CO5:** Explain various rights of disadvantaged people
Reference Books
1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014. 2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014. 3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.
Web Resources 1. Nptel

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						3	1	3	3	2		2		
2						3	1	3	2	2		3		
3						3		3	3	2		3		
4						3		3	2	2		2		
5						3	1	3	3	2		2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	30	30	30	30	30
Understand	30	30	30	30	30
Apply	40	40	40	40	40
Analyze					

Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Human rights resemble natural rights. Justify.
2. How did the idea of human rights protection developed? Explain.

COURSE OUTCOME 2:

1. Classify the universal declaration of human rights.
2. Summarize human rights based from the perspective of the ways of securing them.

COURSE OUTCOME 3:

1. What is dehumanization
2. Explain in detail how the social structure impacts the society

COURSE OUTCOME 4:

1. What if a citizen of a member state of UN feels victim of the violation of the human rights? (BTL
2. Everyone has the right to life, liberty and security of person. Is it the responsibility of the state to ensure these rights? Analyze.

COURSE OUTCOME 5:

1. Define the term “Discrimination against woman”.
2. Illustrate the appointment of chairperson and other members of National human rights commission.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I BASIC CONCEPTS		
1	Introduction	1
2	Individual,Group	1
3	CivilSociety	1
4	State	1
5	Equality	1
6	Justice	1
7	Human Values	1

8	Humanity	1
9	Virtues, Compassion	1
Unit II HUMAN RIGHTS AND HUMAN DUTIES		
1	Human Rights	1
2	Meaning, origin and Development	1
3	Notion and classification of Rights	1
4	Natural, Moral and Legal Rights	1
5	Civil and Political Rights	1
6	Economic and Social rights	1
7	Cultural Rights	1
8	Collective Rights	1
9	Solidarity rights	1
Unit III SOCIAL STRUCTURE AND PROBLEMS		
1	Impact of Social Structure on Human behavior	1
2	Roll of Socialization in Human Values	1
3	Science and Technology, Modernization	1
4	Globalization, and Dehumanization	1
5	Social and Communal Conflicts and Social Harmony	1
6	Rural Poverty, Unemployment, Bonded Labour	1
7	Migrant workers and Human Rights Violations	1
8	Human Rights of mentally	
9	*Physically challenged*	
UNIT IV THEORIES OF HUMAN RIGHTS		
1	Evolution of the concept of Human Rights Magana cart	1
2	Geneva convention of 1864	1
3	Universal Declaration of Human Rights, 1948	1
4	Theories of Human Rights	1

5	Theories and perspectives of UN Laws	1
6	UN Agencies to monitor and compliance	1
7	Human Rights in India	1
8	Constitutional Provisions / Guarantee	2
UNIT V HUMAN RIGHTS OF DISADVANTAGED PEOPLE		
1	Human Rights of Disadvantaged People	1
2	Women, Children	1
3	Displaced persons	1
4	Disability persons, including Aged and HIV Infected People	1
5	Disability persons, including Aged and HIV Infected People	1
6	Implementation of Human Rights – National and State Human Rights Commission	2
7	Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.	2

PROFESSIONAL ELECTIVE IV

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/ Domain
1	21CE6713	Ground Water Engineering	6	3	0	0	3	Water resources
2	21CE6714	Ground Improvement Techniques	6	3	0	0	3	Geotechnical
3	21CE6715	Corrosion and its Control	6	3	0	0	3	Environmental Engineering
4	21CE6716	Design of Brick Masonry Structures	6	3	0	0	3	Structural
5	21CE6717	Geo-Environmental Engineering	6	3	0	0	3	Environmental Engineering
6	21CE6718	Transport Planning and Management	6	3	0	0	3	Transport

21CE6713	GROUND WATER ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Environmental Geology

Objectives

1. To understand various hydrogeological parameters and their estimation, well hydraulics
2. To impart knowledge of well hydraulics
3. To be familiar with various ground water management techniques
4. To provide information on ground water quality and its application
5. To emphasis the importance of ground water conservation

UNIT I	HYDROGEOLOGICAL PARAMETERS	9

Introduction – water bearing Properties of Rock – Type of aquifers – Aquifer properties – Permeability,specific yield, transmissivity and storage coefficient – methods of Estimation – Ground water tablefluctuation and its interpretations – ground water development and Potential in India – GEC norms.

UNIT II	WELL HYDRAULICS	9

Objectives of Ground water hydraulics – Darcy‘s Law – Ground water equation – steady state flow –DupuitForchheimer assumption – unsteady state flow – thesis method – Jacob method

UNIT III	GROUND WATER MANAGEMENT	9

Need for management model- Database for groundwater management – ground water balance study – Introduction to mathematical model – Conjuctive use – Collector well and infiltration gallery.

UNIT IV	GROUND WATER QUALITY	9

Groundwater chemistry – origin, movement and quality – water quality standards – health and aestheticGroundwater chemistry – origin, movement and quality – water quality standards – health and aesthetic.		
UNIT V	**GROUND WATER CONSERVATION**	**9**
Artificial recharge techniques – Remediation of Saline Intrusion – Groundwater management studies –protection zone delineation, Contamination source inventory, remediation schemes-Ground waterPollution and legislation.		
	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Estimate the various aquifer parameters

CO2: Estimate the ground water yield from an open well/ bore well

CO3: Apply mathematical models for ground water management

CO4: Implement various saline water prevention techniques

CO5: Adopt appropriate rainwater harvesting techniques

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.

Reference Books

1. Fitts R Charles. Groundwater Science. Elsevier, Academic Press, 2002
2. Ramakrishnan, S, —Ground Water Hydrology||, K.J. Graph arts, Chennai, 1998.

Web Resources

1. https://nptel.ac.in/courses/105/105/105105042/
2. https://nptel.ac.in/content/syllabus_pdf/105103026.pdf

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2						1					1		2
2	1		2				2							2
3	1	1	3	2	2	1								2
4	1		2		2	2	1							2
5	1	1			2	2						1		2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember					
Understand	50	50	50	50	50
Apply	50	50	50	50	50
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

4. How can you explain water bearing properties of rock? BT-4
5. During Hydro geological investigation two potential aquifers 32km apart ,were located ,one being 5000 years and the other 25000years old. They werefound to be connected by a water bearing stratum of 30m thickness runninginclined at 20m/km. From a few observation wells, the hydraulic gradientwas found to be 0.2m/km. Determine the transmissibility of the water bearingstratum

COURSE OUTCOME 2:

1. A 30cm well fully penetrate a confined aquifer 30m deep. After a longperiod of pumping at a rate of 1200 lpm, the drawdown in the well at 20 and45m from the pumping well are found to be 2.2 and 1.8 m respectively.Determine transmissibility of the aquifer. What is the draw down?
2. State Dupuit - Forcheimer assumptions and its uses in groundwaterhydrology.

COURSE OUTCOME 3:

1. Illustrate the components of groundwater balance equation.
2. Write about Prospects and modern techniques for an optimal groundwater management

COURSE OUTCOME 4:

1. What are the factors influencing the composition of groundwater?
2. Write about the health aspects of water quality.

COURSE OUTCOME 5:

1. List the remediation measures for saline intrusion and explain.
2. What is the purpose of using tracer in ground water study and explain it in detail?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - HYDROGEOLOGICAL PARAMETERS		
1	Introduction – water bearing Properties of Rock	1
2	Type of aquifers – Aquifer properties	1
3	Permeability, specific yield, transmissivity and storage coefficient	2
4	methods of Estimation	1
5	Ground water table fluctuation and its interpretations	2
6	ground water development and Potential in India – GEC norms.	2
Unit II WELL HYDRAULICS		
1	Objectives of Ground water hydraulics	1
2	Darcy‘s Law – Ground water equation	2
3	steady state flow	1
4	waste sampling and reduction of wastes at source	1
5	Dupuit Forchheimer assumption	1
6	unsteady state flow	1
7	thesis method	1
8	Jacob method	1
Unit III GROUND WATER MANAGEMENT		
1	Need for management model	1
2	Database for groundwater management	2
3	ground water balance study	1
4	Introduction to mathematical model	2

5	Conjuctive use	1
6	Collector well and infiltration gallery.	2
Unit IV GROUND WATER QUALITY		
1	Groundwater chemistry – origin, movement and quality	2
2	water quality standards	1
3	health and aesthetic	1
4	Groundwater chemistry - origin, movement and quality	2
5	water quality standards	1
6	health and aesthetic	2
Unit V GROUND WATER CONSERVATION		
1	Artificial recharge techniques	2
2	Remediation of Saline Intrusion	2
3	Groundwater management studies	1
4	protection zone delineation, Contamination source inventory	2
5	remediation schemes	1
6	Ground water Pollution and legislation	1

21CE6714	GROUND IMPROVEMENT TECHNIQUES	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Soil mechanics
- Foundation Engineering

Objectives

1. To improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods

UNIT I	INTRODUCTION	9

Role of ground improvement in foundation engineering - Methods of ground improvement – Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil condition.

UNIT II	DRAINAGE AND DEWATERING	9

Drainage techniques - Groundwater lowering by well points – Deep well – Vacuum and electro–osmosis methods- Seepage analysis for two dimensional flow-Fully and partially penetrating slots in homogenous deposits.

UNIT III	IN SITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS	9

In-situ densification of cohesion less and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibroflotation - Sand pile compaction - Preloading with sand drains and fabric drains – Stone columns – Lime piles - Installation techniques only - relative merits of various methods and theirlimitations.

UNIT IV	EARTH REINFORCEMENT	9

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth – use of Geotextiles f or filtration, drainage and separation in road and other works.

UNIT V	GROUT TECHNIQUES	9

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring – Stabilization with cement, lime and chemicals - Stabilization of expansive soils.

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Identify the soil and select suitable ground improvement methods.
CO2: Choose the suitable dewatering techniques

CO3: Identify the type of soil and select suitable compaction method
CO4: Apply suitable techniques for improving the soil properties in the field
CO5: Use various types of techniques to strengthen the soil.

Text Books

1. Purushothama Raj, P. ―Ground Improvement Techniques‖, Tata McGraw Hill Publishing Company,New Delhi, 2007.
2. Robert M Koerner, ―Design with Geosynthetics‖, Prentice Hall, New Jersey, 2005.

Reference Books

1. Joseph E Bowles, ―Foundation Analysis and Design‖, McGraw Hill Companies. Inc., New York,1997.
2. Braja M Das, ―Principles of Foundation Engineering‖, Thomson Publishing Company, Brooks/Cole Division, 1999.
3. Shashi K Gulhati and Manoj Datta, ―Geotechnical Engineering‖, Tata McGraw Hill Education (P) Ltd., New Delhi, 2010.
4. Kenneth D Weaver and Donald A Bruce, ―Dam Foundation Grouting‖, ASCE Press, Virginia, 2007

Web Resources

3. https://nptel.ac.in/courses/105108075

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		3		3		3							3
2	3				3		3		3		3			3
3	3								3		2			3
4	3										3			3
5	3		2		3		3		2					3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	50	50	50	50	50
Apply	30	30	30	30	30
Analyze					

Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. What are the various Geo technical problem faced with Black cotton soil , Laterite Soil and Alluvial Soil
2. Explain in brief the various methods of Ground Improvement

COURSE OUTCOME 2:

1. Explain in detail with a neat sketch the method of dewatering using sumps and ditches stating its advantages and disadvantages.
2. Explain in brief the various steps for designing a dewatering system.

COURSE OUTCOME 3:

1. Explain in detail the method of dynamic compaction of cohesionless and Dynamicconsolidation of cohesive soils
2. How is a stone column installed by vibro-displacement method?

COURSE OUTCOME 4:

1. Explain with the help of a flow chart with a various classification of geosynthetics in details
2. How do geosynthetics function as a filter? How does it differ in its function fordrainage? Explain in details with neat sketches

COURSE OUTCOME 5:

1. Describe in detail about the various methods of grouting with neat sketches.
2. What is grout injection measurement? Why is grout monitoring necessary?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION		
1	Introduction	1
2	Role of ground improvement in foundation engineering	1

3	Methods of ground improvement	2
4	Geotechnical problems in alluvial soils	1
5	Geotechnical problems in laterite and black cotton soils	2
6	Selection of suitable ground improvement techniques based on soil condition.	2
UNIT II DRAINAGE AND DEWATERING		
1	Drainage techniques	1
2	Groundwater lowering by well points - Deep well	2
3	Vacuum and electro–Osmosis methods	2
4	Seepage analysis for two dimensional flow	2
5	Fully and partially penetrating slots in homogenous deposits	2
UNIT III IN SITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS		
1	In-situ densification of cohesion less and consolidation of cohesive soils	1
2	Dynamic compaction and consolidation -Vibroflotation	2
3	Sand pile compaction - Preloading with sand drains and fabric drains	2
4	Stone columns – Lime piles	2
5	Installation techniques only	1
6	Relative merits of various methods and their limitations	1
UNIT IV EARTH REINFORCEMENT		
1	Concept of reinforcement	1
2	Types of reinforcement material	1
3	Applications of reinforced earth	2
4	Use of Geotextiles for filtration	2
5	Use of Geotextiles for drainage	2

6	Separation in road and other works.	1
UNIT V GROUT TECHNIQUES		
1	Introduction	1
2	Types of grouts	2
3	Grouting equipment and machinery	1
4	Injection methods	2
5	Grout monitoring	2
6	Stabilization with cement, lime and chemicals	1

21CE6715	CORROSION AND ITS CONTROL	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Chemistry for Civil Engineering
- Building Materials and Constructions

Objectives

1. To get idea on Forms of Corrosion
2. To gain knowledge on Protection Methods

UNIT I	INTRODUCTION	9

Corrosion – Theoretical Background –Corrosion Damage – Classification – Principals – Electrochemical aspects – Polarization – passivity - Environmental effects – Effects of oxygen, oxidizers, velocity, Temperature – Corrosive Concentration – Galvanic compiling – inspection

UNIT II	FORM OF CORROSION	9

Galvanic corrosion – creative corrosion pitting – Intergranular corrosion – Selective leaching – Erosion Corrosion – Stress Corrosion – Hydrogen Damage.

UNIT III	CORROSION DESTINY	9

Clarification – Purpose – Specimens – Surface Preparation – Measuring and washing – Exposure Technique - Duration – Planned – Internal tests – Aeration – Temperature – Corrosion Rate – NACE test methods – Slav Strain Rosette.

UNIT IV	CORROSION PROTECTION	9

Corrosion inhibitors – Electroplated coatings – Conversion coatings – Anodizing – Hot dipping – Sprayed metal coatings – Zinc coating – Alloying – Powder coating – Composite materials in Corrosion management – Electrical methods – Thermal sprayed coatings – Halogen corrosion challemyl; Sea shore – Corrosion control methods

UNIT V	STRUCTURAL CORROSION	9

Corrosion of reinforcement in concrete – Factors influencing corrosion – Damages caused by corrosion – Preventive measures in constructions – tests for existing structures – remedial measures – Corrosion Analyzer – Case studies.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:
CO1: Understand the classification and its principals **CO2:** Study the forms of corrosion **CO3:** Identify the measuring and exposure techniques **CO4:** Carry out the protection methods. **CO5:** Identify the structural corrosion.
Text Books
1. Mars.G. Fontana, Corrosion Engg., Mc Graw Hill International, 1981. 2. Mohamed A. El-Reddy, Steel-Reinforced Concrete Structures – Assessment and Repair of Corrosion‖, CRC-Press, 2008.
Reference Books
1. Corrosion Hand Book, Electro Chemical Society of India, 1998. 2. A.R. Santhakumar, Concrete Technology, Oxford University. 2007 3. Zaki Ahmad, Digby Macdonald, —Principles of Corrosion Engineering and Corrosion Control‖, Butterworth-Heinemann, 2013
Web Resources **1.** https://www.youtube.com/playlist?list=PLvfdyaivecUGuljfNKj0qcfITjTggsWAI **2.** https://nptel.ac.in/courses/113/104/113104082/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1							1					1		
2			1		1		2							
3			1		1		1							
4					2						1	1		
5			1				1		2					

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	50	50	50	50	50
Understand	50	50	50	50	50

Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain in detail on different types of corrosion
2. Explain the electro chemical theory of wet corrosion with mechanisms.

COURSE OUTCOME 2:

1. Inspect the type of Galvanic and differential aeration corrosions.
2. Explain differential aeration corrosion? Explain with an example.

COURSE OUTCOME 3:

1. Explain in detail on the internal test on corrosion density.
2. List out propose the various factors influencing the rate of corrosion.

COURSE OUTCOME 4:

1. How is corrosion prevented by cathodic protection? Explain
2. Explain the role of composite materials in protection.

COURSE OUTCOME 5:

1. Explain in detail on the factors influencing structural corrosion.
2. Explain the remedial measures in corrosion and corrosion analyzer.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION		
1	Corrosion – Theoretical Background Classification	1
2	Corrosion Damage Principals	1
3	Electrochemical aspects	1
4	Polarization passivity	1
5	Environmental effects	1
6	Effects of oxygen, oxidizers, velocity, Temperature	1

7	Corrosive Concentration	1
8	Galvanic compiling	1
9	inspection	1
Unit II FORM OF CORROSION		
1	Galvanic corrosion	1
2	creative corrosion pitting	1
3	Intergranular corrosion	1
4	Selective leaching	2
5	Erosion Corrosion	1
6	Stress Corrosion	1
7	Hydrogen Damage.	2
Unit III CORROSION DESTINY		
1	Clarification	1
2	Purpose	1
3	Specimens	1
4	Surface Preparation	1
5	Measuring and washing	1
6	Duration, Planned, Internal tests	1
7	Aeration ,Temperature	1
8	Corrosion Rate	1
9.	NACE test methods ,Slav Strain Rosette.	1
Unit IV CORROSION PROTECTION		
1	Corrosion inhibitors	1
2	Electroplated coatings – Conversion coatings	2
3	Anodizing , Hot dipping , Sprayed metal coatings , Zinc coating – Alloying ,Powder coating	2
4	Composite materials in Corrosion management	2

5	Electrical methods – Thermal sprayed coatings ,Halogen corrosion challemyl.	2
Unit V STRUCTURAL CORROSION		
1	Corrosion of reinforcement in concrete	1
2	Factors influencing corrosion	2
3	Damages caused by corrosion	1
4	Preventive measures in constructions	1
5	Tests for existing structures	2
6	Remedial measures	1
7	Corrosion Analyzer.	1

21CE6716	DESIGN OF BRICK MASONRY STRUCTURES	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Construction materials
- Strength of materials

Objectives

2. To enable the students to explain engineering properties and uses of brick masonry units, defects and crack in masonry and its remedial measures.
3. To summarize various formulae's for finding compressive strength of brick masonry units.
4. To explain permissible stresses and design criteria as per IS: 1905 and SP-20.
5. To design brick masonry walls for different load considerations

UNIT I	MASONRY UNITS	9

Bricksmasonry units- strength, modulus of elasticity and water absorption of masonry materials – classification and properties of mortars. Defects and Errors in masonry construction – cracks in masonry, types, reason for cracking, methods of avoiding cracks.

Strength and Stability: Strength and stability of axially loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship. Compressive strength formulae based on elastic theory.

UNIT II	PERMISSIBLE STRESSES	9

Types of walls - permissible compressive stress - stress reduction and shape modification factors - increase in permissible stresses for eccentric vertical and lateral load - permissible tensile stress and shear stresses.

UNIT III	LOAD AND DESIGN CONSIDERATIONS	9

Loads on masonry structure – design consideration -Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Design considerations for solid walls, cavity walls, wall with pillars

UNIT IV	DESIGN OF BRICK WALLS	9

Design of walls subjected to concentrated axial loads: Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers, design of wall with openings.

Design of walls subjected to eccentric loads: Design criteria – stress distribution under eccentric loads – problems on eccentrically loaded solid walls, cavity walls, walls with piers.

UNIT V	DESIGN OF LATERALLY AND TRANSVERSELY LOADED WALLS	9

Design criteria and design of solid wall under wind loading - design of panel wall – Design of a Straight Free-Standing Wall - Design of a Staggered Free-Standing Wall – design criteria of masonry retaining walls.

	Total Periods	45

Suggestive Assessment Methods		
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
2. Descriptive written exam	3. Assignments 4. Quiz	2. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand the brick masonry construction and its strength and stability requirement.
CO2: Use various permissible stresses for design of brick walls as per IS code's provisions
CO3: Consider various loads and design parameters
CO4: Design a brick wall under concentrated axial and eccentric loading conditions
CO5: Design a brick wall under lateral (wind load) and transverse loading conditions

Text Books

1. Henry, A.W., "Structural Masonry", Macmillan Education Ltd., (1990).
2. Dayaratnam P, "Brick and Reinforced Brick Structures", Oxford & IBH (1987).
3. M. L. Gambhir, "Building and Construction Materials", Mc Graw Hill education Pvt. Ltd. (2013)

Reference Books

1. IS 1905–1987 "Code of practice for structural use o f un-reinforced masonry- (3rd revision) BIS, New Delhi. (1987)
2. SP 20 (S&T) – 1991, "Hand book on masonry design and construction (1st revision) BIS, New Delhi. (1991)
3. Dayaratnam, P., "Brick and Reinforced Brick Structures", Oxford & IBH Publishing House. (1997)
4. Sinha, B.P and Davies, S.R, "Design of Masonry Structures", E & FN spon, (1997).

Web Resources

1. https://archive.nptel.ac.in/courses/105/106/105106197/
2. https://nptel.ac.in/courses/105106197

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1	1	-	-	-	-	1	1	1	-	2	2	-
2	3	2	1	-	-	-	-	1	1	1	-	2	3	-
3	3	3	1	-	-	-	-	1	1	1	-	2	3	-
4	3	3	2	-	-	-	-	1	1	1	-	2	3	-

5	3	3	2	-	-	-	-	1	1	1	-	2	3	-

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**FAT 1**	**FAT 2**	**END SEM EXAM**
Remember	20	20	20	20	20
Understand	20	20	20	20	20
Apply	60	60	60	60	60
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

7. Describe the followings:
    - **a.** defects and Errors in masonry construction
    - **b.** cracks in masonry
    - **c.** reason for cracking
    - **d.** methods of avoiding cracks
8. Discuss: effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing

COURSE OUTCOME 2:

3. By the reference of IS: 1905 – 1987, discuss the permissible compressive stresses for various mortar types. Also, explain the importance of height to width ration in the permissible stress calculation
4. Enumerate various reduction factors involved in the design of brick masonry wall

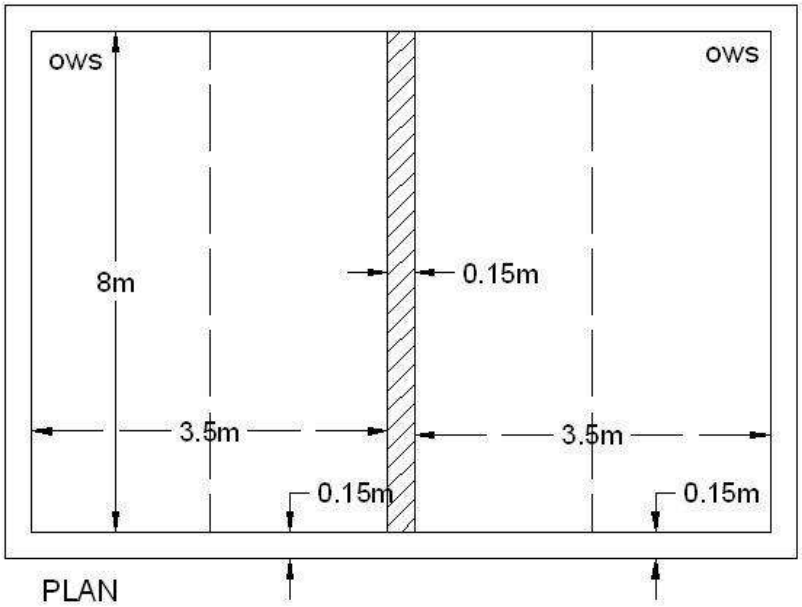
COURSE OUTCOME 3:

1. Explain in details about the design consideration for solid wall, cavity wall and wall with pillers
2. Discuss in details about Effective height of walls, openings in walls, effective length, effective thickness, slenderness ratio

COURSE OUTCOME 4:

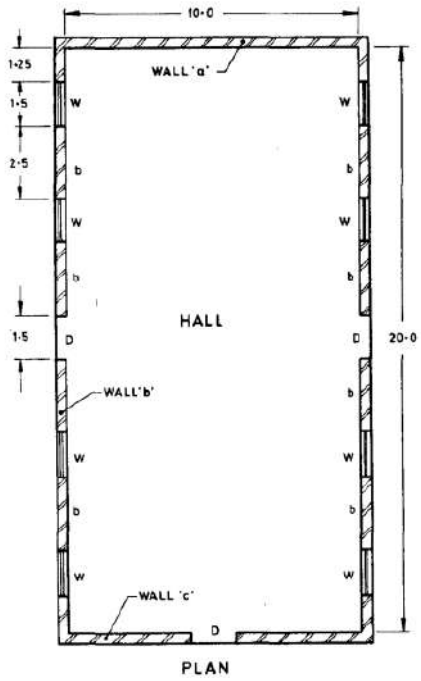
1. Design an interior cross wall for a two storeyed building to carry 100mm thick RC slab with 3m storey height. The wall is unstiffened and supports 2.65m wide slab. Loading on the slab is given as below:
   Live load on floor slab = 2 kN/m2
   Live load on roof slab = 1.5 kN/m2
   Floor finish = 0.2 kN/m2
   Roof finish = 1.96 kN/m2

2. Design the interior wall of a single storey building shown in figure. The height of the ceiling is 3.5m and the load from slab including self-weight is 30kN/m2.
   Load from slab = 30 x 3.65 = 109.5 kN/m
   Self-weight of wall = 0.15 x 3.5 x 1 x 20 = 10.5 kN/m
   Total = 120 kN/m

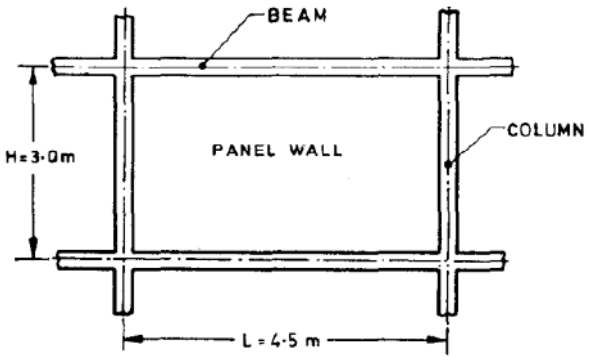


COURSE OUTCOME 5:

3. A hall as shown in Fig. and of inside dimensions 10.0 m X 20.0 m with a clear height of 5.5 mup to the bottom of beam is to be constructed with load bearing masonry walls using modular bricks. Calculate thickness of walls, strength of bricks and grade of mortar for longitudinal and cross walls, assuming a wind pressure of 1200 N/m^2



4. In a framed structure a panel wall (see Fig) of brickwork 23 cm thick is 4.5 m long and 3 m high (between centres of supports). If the panel is subjected to a horizontal wind pressure of 750 N,'m', determine the mix of motar for the brickwork assuming:



a) panel is supported at top and bottom and is free on other 2 edges,

b) panel is free at the top and supported on other 3 edges, and

c) panel is supported on all 4 edges.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - MASONRY UNITS		
1	Bricks masonry units- strength, modulus of elasticity	1
2	Water absorption of masonry materials	1

3	Classification and properties of mortars	1
4	Defects and Errors in masonry construction	1
5	Cracks in masonry, types, reason for cracking, methods of avoiding cracks.	1
6	Strength and stability of axially loaded masonry walls	1
7	Effect of unit strength, mortar strength, joint thickness, rate of absorption	1
8	Effect of effect of curing, effect of ageing, workmanship	1
9	Compressive strength formulae based on elastic theory	1
Unit II PERMISSIBLE STRESSES		
1	Types of walls	1
2	Permissible compressive stress	2
3	Stress reduction factors	1
4	Shape modification factors	1
5	Increase in permissible stresses for eccentric vertical and lateral load	2
6	Permissible tensile stress and	1
7	Shear stresses.	1
Unit III LOAD AND DESIGN CONSIDERATIONS		
1	**Loads on masonry structure**	1
2	Design criteria	2
3	Effective height of walls and columns	1
4	Openings in walls, effective length, effective thickness	1
5	Slenderness ratio, eccentricity, load dispersion	1
6	Arching action in lintels.	1
7	Design considerations for solid walls, cavity walls, wall with pillars	2
Unit IV DESIGN OF BRICK WALLS		
1	**Design of walls subjected to concentrated axial loads:**Solid	2

	walls	
2	**Design of walls subjected to concentrated axial loads:**cavity walls	1
3	**Design of walls subjected to concentrated axial loads:**Solid walls with pillars	1
4	**Design of walls subjected to eccentric loads:**Design criteria	1
5	Stress distribution under eccentric loads	1
6	Problems on eccentrically loaded solid walls	1
7	Problems on eccentrically loaded cavity walls	1
8	Problems on eccentrically loaded walls with piers	1
Unit V DESIGN OF LATERALLY AND TRANSVERSELY LOADED WALLS		
1	Design criteria	1
2	design of solid wall under wind loading	2
3	design of panel wall	2
4	Design of a Straight Free-Standing Wall	2
5	Design of a Staggered Free-Standing Wall	1
6	design criteria of masonry retaining walls.	1

21CE6717	GEO-ENVIRONMENTAL ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Environmental Sciences

Objectives

1. The student acquires the knowledge on the Geotechnical engineering problems associated with soil contamination, safe disposal of waste and remediate the contaminated soils by different techniques thereby protecting environment

UNIT I	GENERATION OF WASTES AND CONSEQUENCES OF SOIL POLLUTION	9

Introduction to Geo environmental engineering – Environmental cycle Sources, production and classification of waste – Causes of soil pollution – Factors governing soil pollution interaction clay minerals - Failures of foundation due to waste movement

UNIT II	SITE SELECTION AND SAFE DISPOSAL OF WASTE	9

Safe disposal of waste – Site selection for landfills – Characterization of landfill sites and waste – Risk assessment – Current practice of waste disposal – Monitoring facilities – Passive containment system – Application of geosynthetics in solid waste management – Rigid or flexible liners

UNIT III	TRANSPORT OF CONTAMINANTS	9

Contaminant transport in subsurface – Advection, Diffusion, Dispersion – Governing equations – Contaminant transformation – Sorption – Biodegradation – Ion exchange – Precipitation – Hydrological consideration in landfill design – Groundwater pollution.

UNIT IV	WASTE STABILIZATION	9

Stabilization - Solidification of wastes – Micro and macro encapsulation – Absorption, Adsorption, Precipitation – Detoxification – Mechanism of stabilization – Organic and inorganic stabilization – Utilization of solid waste for soil improvement – case studies.

UNIT V	REMEDIATION OF CONTAMINATED SOILS	9

Exsitu and Insitu remediation-Solidification, bio-remediation, incineration, soil washing, phyto remediation, soil heating, vetrification, bio-venting.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:
CO1: Assess the contamination in the soil **CO2:** Understand the current practice of waste disposal **CO3:**Identification of suitable site for solid waste disposal **CO4:** Stabilize the waste and utilization of solid waste for soil improvement. **CO5:** Select suitable remediation methods based on contamination.
Text Books
1. Hari D. Sharma and Krishna R.Reddy. — Geo-Environmental Engineering- John Wiley and Sons. INC, USA, 2004 2. Daniel B.E, —Geotechnical Practice for waste disposal‖, Chapman & Ha;;, Landon 1993 3. Manoj Datta, —Waste disposal in Engineered landfills‖, Narosa Publishing House, 1997 4. Manoj Datta, B.P. Parida, B.K.Guha, —Industrial Solid Waste Management and Landfilling Practice‖. Narosa Publishing House. 1999
Reference Books
1. Westlake, K, —Landfill Waste pollution and control‖, Albion Publishing Ltd., England, 1995. 2. Wentz, C.A., —Hazardous Waste Management‖, McGraw Hill, Singapore, 1989
Web Resources **1.** https://nptel.ac.in/courses/105/103/105103025/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3				3						3	3
2							3					3		
3	3	3	3				3					3	3	3
4	3			3			3						3	
5		2		2			3					3		2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	50	50	50	50	50
Understand	50	50	50	50	50

Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Enumerate the causes of pollution and classification of waste.

2. Geo environmental engineering is multidisciplinary. Justify your answer

COURSE OUTCOME 2:

1. Explain the factors to be considered for the selection of site for landfill
2. Explain the different liner system.

COURSE OUTCOME 3:

1. Explain the significance of soil sorption behavior in waste management.
2. Write briefly about transport of contaminant in saturated soil

COURSE OUTCOME 4:

1. Explain the stabilization of waste.
2. Describe the utilization of solid waste for soil improvement.

COURSE OUTCOME 5:

1. Write briefly about bioremediation.
2. What are the various types of Phyto remediation?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - GENERATION OF WASTES AND CONSEQUENCES OF SOIL POLLUTION		
1	Introduction to Geo environmental engineering	2
2	Environmental cycle Sources, production and classification of waste	2
3	Causes of soil pollution	1

4	Factors governing soil pollution interaction clay minerals	2
5	Failures of foundation due to waste movement	2
Unit II SITE SELECTION AND SAFE DISPOSAL OF WASTE		
1	Safe disposal of waste	1
2	Site selection for landfills – Characterization of landfill sites and waste Risk assessment	2
3	Passive containment system	1
4	Current practice of waste disposal	1
5	Application of geosynthetics in solid waste management	2
6	Rigid or flexible liners	2
Unit III TRANSPORT OF CONTAMINANTS		
1	Contaminant transport in subsurface	1
2	Advection, Diffusion, Dispersion	1
3	Governing equations	1
4	Contaminant transformation	1
5	Sorption, Biodegradation	1
6	Ion exchange ,Precipitation	2
7	Hydrological consideration in landfill design	1
8	Groundwater pollution	1
Unit IV WASTE STABILIZATION		
1	Stabilization	1
2	Solidification of wastes	1
3	Micro and macro encapsulation	1
4	Absorption, Adsorption, Precipitation	1
5	Detoxification	1
6	Mechanism of stabilization	1
7	Organic and inorganic stabilization	1
8	Utilization of solid waste for soil improvement	1

9	case studies.	1
Unit V REMEDIATION OF CONTAMINATED SOILS		
1	Ex Situ and Insitu remediation	1
2	Solidification	1
3	bio-remediation	1
4	incineration	1
5	soil washing	1
6	phyto remediation	1
7	soil heating	1
8	vitrification	1
9	bioventing.	1

21CE6718	TRANSPORT PLANNING AND MANAGEMENT	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Surveying I
- Surveying II

Objectives

1. To understand the concepts of transport planning and evaluation techniques

UNIT I	TRANSPORT PLANNING PROCESS	9

Scope – interdependence of land use and traffic – systems approach to transport planning – survey of existing conditions and forecasting future conditions. Transport survey – definition of study area – zoning survey – types and methods – inventory on transport facilities – inventory of land use and economic activities.

UNIT II	TRIP GENERATION	9

Factors governing trip generation and attraction rates – multiple linear regression analysis – category analysis – critical appraisal of techniques

UNIT III	DISTRIBUTION METHODS	9

Uniform factor method & average factor methods – gravity model and its calibration – opportunity model – use of software in transportation engineering.

UNIT IV	TRIP ASSIGNMENT AND MODAL SPLIT	9

Traffic assignment – general principles – assignment techniques – all nothing assignment – multiple root assignment – capacity – restraint assignment – diversion curves Modal split – advantages and limitations.

UNIT V	EVALUATION TECHNIQUES	9

Economic evaluation techniques – performance evaluation – rating and ranking methods – case studies in evaluation – rating and ranking methods – case studies in evaluation of transport projects – land use transport models – transport planning for medium and small sized towns.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Study scope and types of the transportation planning system
CO2: Understand the trip generation and its analysis

CO3: Adopt various distribution methods in transport planning
CO4: Manage the traffic congestion using the available management measures.
CO5: Evaluate the transportation planning alternates

Text Books

1. L.R. Kadiyali, Traffic Engineering and Transport planning, Khanna Publishers, New Delhi,2011

Reference Books

1. Paul.H.Wright, Transportation Engineering – Planning & Design, John Wiley & Sons, NewYork Fourth Edition 1998.
2. John W Dickey, Metropolitan Transportation Planning, Tata McGraw-Hill Publishing CompanyLtd, New Delhi 1997.

Web Resources

1. https://nptel.ac.in/courses/105107067

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3		3		3		3							3
2	3				3		3		3		3			3
3	3								3		2			3
4	3										3			3
5	3		2		3		3		2					3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	50	50	50	50	50
Apply	30	30	30	30	30
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain briefly about the systems approach to transport planning
2. Explain briefly about the land use transportation policy along with the cycle?

COURSE OUTCOME 2:

1. Explain briefly about the Factors governing trip generation and attraction rates
2. Explain briefly about the critical appraisal of techniques

COURSE OUTCOME 3:

1. Explain briefly about the Uniform factor method & average factor methods
2. Explain briefly about the use of software in transportation engineering.

COURSE OUTCOME 4:

1. Explain briefly about the general principles of trip assignment techniques
2. What is predistribution model split and what are the advantages and limitations ofpredistribution model split

COURSE OUTCOME 5:

1. Explain briefly about the Economic evaluation techniques
2. Construct the case studies in evaluation of transport projects

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - TRANSPORT PLANNING PROCESS		
1	Introduction , Scope	1
2	Interdependence of land use and traffic	1
3	Systems approach to transport planning	1
4	Survey of existing conditions and forecasting future conditions	1
5	Transport survey	1
6	Definition of study area zoning survey	1
7	Types and methods	1
8	Inventory on transport facilities	1
9	Inventory of land use and economic activities.	1
UNIT II TRIP GENERATION		

1	Introduction	1
2	Factors governing trip generation and attraction rates	2
3	Multiple linear regression analysis	2
4	Category analysis	2
5	Critical appraisal of techniques	2
UNIT III DISTRIBUTION METHODS		
1	Introduction	1
2	Uniform factor method & average factor methods	2
3	Gravity model and its calibration	2
4	Opportunity Model	2
5	Use of software in transportation engineering	2
UNIT IV TRIP ASSIGNMENT AND MODAL SPLIT		
1	Traffic assignment	1
2	General Principles	1
3	Assignment Techniques – All Nothing Assignment	2
4	Multiple root assignment - Capacity	2
5	Restraint Assignment -Diversion curves Modal split	2
6	Advantages and limitations.	1
UNIT V EVALUATION TECHNIQUES		
1	Economic Evaluation Techniques	2
2	Performance Evaluation	2
3	Rating and Ranking methods	1
4	Case Studies in Evaluation - Rating and Ranking Methods	2
5	Case studies in evaluation of transport projects	1
6	Land use transport models – Transport planning for medium and small sized towns.	1

Professional Elective V

S.No	Course Code	Course Name	semester	L	T	P	C	Stream/ Domain
1	21CE7701	Interior Decoration	7	0	0	3	3	Architecture
2	21CE7702	Prestressed concrete structures	7	0	0	3	3	Structural
3	21CE7703	Structural Health Monitoring	7	0	0	3	3	Structural
4	21CE7704	Introduction to Soil Dynamics and Machine Foundations	7	0	0	3	3	Geotechnical
5	21CE7705	Prefabricated Structures	7	3	0	0	3	Structural
6	21CE7706	Entrepreneurship Development	7	3	0	0	3	Entrepreneurship

21CE7701	INTERIOR DECORATION	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Computer Aided Building Drawing - I
- Computer Aided Building Drawing - II

Objectives

1. To introduce the fundamentals related to the interior design.
2. To provide knowledge on principles and elements of interior design.
3. To create awareness about the materials used for interior decoration.
4. To impart knowledge on interior layout.
5. To provide knowledge on various types of staircases

UNIT I	INTRODUCTION	9

Importance of interior designing and Drawing instruments, drawing sheet, Lettering.- materials used-care and maintenance- . Introduction to code of practice - general Interior and Interior drawings - definitions- construction of plan-elevation- section- Use anthropometrics in interiors- VastuSastra - uses in interior design

UNIT II	PRINCIPLES AND ELEMENTS OF INTERIOR DESIGN	9

Introduction – Element of interior design-Principles of interior design

UNIT III	DECORATIVE MATERIALS	9

Introduction -properties of materials- Choice and selection of interior material--Types of ceramic materials-glasses and plywood -their utilization in interior design- Concept of paints, Varnishes and distemper- Concept of colour and Lights

UNIT IV	INTERIOR LAYOUT	9

Layout of window, door and furniture –Concept of Air conditioning layout -Concept of Gardening layout-Concept of False Ceiling –General Plumbing and Sanitary fitting –General layout of kitchen and toilet – General layout of bed room and dining hall.

UNIT V	**STAIRCASES**	**9**

Materials - plan and design of staircase-details of construction-bricks- stone - R.C.C –mezzanine floor- elegance-order in choice of staircase.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Discover foundations of interior design.
CO2: Solve engineering system challenges utilizing the principle of static equilibrium.
CO3: Locate the centroid of objects such as areas and volumes, the center of mass of the body and the center of gravity and combined regions' moment of inertia
CO4: Handle issues involving kinematics and kinetics of stiff bodies in planar motion.
CO5: Respond questions concerning machine frictional phenomena andcomprehend the translation and rotation of a stiff body.

Text Books

1.Pratap. R.M, “Interior Design principles and practice”, Standard publishers distribution, Delhi,1988.

2. Faulkner, S.-and Faulkner,R, “Inside Today’s Home”, Rine hart publishing company, New york. 1987

Reference Books

1. Seetharaman P. “Interior Design And Decoration”, Text books zone, 2014.

Web Recourses

1. https://nptel.ac.in/courses/124107006

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	1	-	-	-	1	1	1	-	1		
2	3	2	1	1	-	-	-	1	1	-	-	1		
3	3	2	1	1	-	-	-	1	1	-	-	1		
4	3	2	1	1	-	-	-	1	1	-	-	1		
5	3	2	1	1	-	-	-	1	1	-	-	-		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember					
Understand	50	50	50	50	50
Apply	50	50	50	50	50
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain the science behind vasthusasthra and mention few advantages for the sustainable energy saving mechanism in it.
2. List few hardware and software tools used in interior decorations

COURSE OUTCOME 2:

1. Explain the principles adopted in designing a false celling.
2. Mention few elements in interior design

COURSE OUTCOME 3:

1. Brief the mechanisms in choosing the colours and decorative lights for interior wall.

2. Explicit the complications in choosing the materials for interior design with real time example.

COURSE OUTCOME 4:

1. Locate the position of Air conditioner in a building to get its optimum power usage.
2. Sketch the layout of a modern toilet and modular kitchen.

COURSE OUTCOME 5:

1. Briefly explain the types of stair cases with sketches with its advantages and elegance.
2. Mention requirements for each staircase types.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION		
1	Importance of interior designing and Drawing instruments, drawing sheet, Lettering.	1
2	Materials used-care and maintenance	1
3	Introduction to code of practice	1
4	General Interior and Interior drawings	2
5	Construction of plan-elevation- section	2
6	Use anthropometrics in interiors-VastuSastra and its uses in interior design	2
UNIT II PRINCIPLES AND ELEMENTS OF INTERIOR DESIGN		
1	Introduction	3
2	Element of interior design	3
3	Principles of interior design	3
UNIT III DECORATIVE MATERIALS		

1	Introduction	2
2	Properties of materials	1
3	Choice and selection of interior material	1
4	Parallel axis theorem, perpendicular axis theorem Polar moment of inertia	1
5	Types of ceramic materials such as glasses and plywood and their utilization in interior design	1
6	Concept of paints, Varnishes and distemper	2
7	Concept of colour and Lights	1
UNIT IV INTERIOR LAYOUT		
1	Layout of window, door and furniture	2
2	Concept of Air conditioning layout	1
3	-Concept of Gardening layout	1
4	Concept of False Ceiling	1
5	General Plumbing and Sanitary fitting	1
6	General layout of kitchen and toilet	1
7	General layout of bed room and dining hall	2
UNIT V STAIRCASES		
1	Materials	2
2	Plan and design of staircase	2
3	Details of construction using bricks- stone - R.C.C	1
4	Mezzanine floor	2

5	Elegance	1
6	order in choice of staircase	1

21CE7702	PRESTRESSED CONCRETE STRUCTURES	L	T	P	C
		3	0	0	3

Pre requisites for the course

- Design of Reinforced concrete elements
- Design of Steel Structures

Objectives

1. To introduce the need for prestressing as well as the methods, Types and advantages of pre stressing to the students.
2. Students will be introduced to the design of prestressed concrete structures subjected to flexure and shear

UNITI	INTRODUCTION–THEORYANDBEHAVIOUR	9

Basic Principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – High strength concrete and high tensile steel – Methods of prestressing – FreyssinetandMagnelBlatonmethod-Analysisofsectionsforstressesbystressconcept,Strength concept and load balancing concept, Loss of Prestress.

UNITII	DESIGN FOR FLEXUREAND SHEAR	9

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete asper IS1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensionedbeams–CheckforstrengthasperIS1343Code–Layoutofcablesinpost-tensionedbeams– Location of wires in pre-tensioned beams.

UNITIII	DEFLECTIONANDDESIGNOFANCHORAGEZONE	9

Introduction – Short term deflections of uncracked members – Prediction of long term deflectionsdue to creep and shrinkage – Check for serviceability limit state of deflection. Determination ofanchorage zone stresses in post-tensioned beams by Magnel‘s method, Guyon‘s method and IS1343 code – design of anchorage zone reinforcement.

UNITIV	COMPOSITE BEAMSAND 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 ofstresses – Principles of design.

UNITV	THEORYOFMISCELLANEOUSSTRUCTURES	9

Pipes– Partial prestressing – Definition, methods of achieving partial prestressing, Merits anddemerits of partial prestressing

TotalPeriods	45

SuggestiveAssessment Methods		
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End SemesterExams (60 Marks)**
1.Descriptive written exam	1. Assignments 2. Quiz	1.Descriptive writtenexam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Selection of various methods of prestressing.
CO2: Apply the design codes relevant to the design of prestressed concrete structures.
CO3: Design for deflection and crack control of prestressed concrete structures.
CO4: Analysis and design of composite beam construction
CO5: Design of various prestressed concrete members

TextBooks

1. KrishnaRajuN.,"PrestressedConcrete",5thEdition,TataMcGrawHillCompany,NewDelhi,2012
2. PanditG.S.andGuptaS.P."PrestressedConcrete'',CBSPublishersandDistributorsPvt.Ltd,NewDelhi, 2012.

ReferenceBooks

1. Dayaratnam.P,"PrestressedConcreteStructures",OxfordandIBH,Bangalore,2013.
2. LinT.Y.andNed.H.Burns,"DesignofPrestressedConcreteStructures",3rd.,WileyIndiaPvt.Ltd. New Delhi, 2013.
3. IS 1343:2012, Code of Practice for Prestressed Concrete Structures, Bureau of IndianStandards, New Delhi.

WebResources

1.https://nptel.ac.in/courses/105106117

COVs PO Mapping and COVs PSO Mapping

CO	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3		3							3	3	3	2
2	3	3	3			3	2				2	2	3	1
3	1	1		2			3					3	3	2

4	3	3	3			3		3					3	2
5	2	2		2								3	3	2

BLOOMSLEVELASSESSMENTPATTERN

BLOOMS CATEGORY	**CAT1**	**CAT2**	**FAT1**	**FAT2**	**END SEMEXAM**
Remember	10	10	10	10	10
Understand	10	10	10	10	10
Apply					
Analyze	80	80	80	80	80
Evaluate					
Create					

COURSELEVELASSESSMENTQUESTIONS

COURSE OUTCOME 1:

1. APSCbeamwithrectangularsection,150mmwideand300mmdeepisprestressed by BT1 three cables each carrying an effective prestress of 200kN. The spanof the beam is 12m. The first cable is parabolic with an eccentricity of 50m axis at thecenter of the span and 50mm above the centroidal axis at the supports. The second cable isparabolic with an eccentricity of 50mm at the center of the span and zero eccentricity atthesupports.Thethirdcableisstraightwithaneccentricityof50mmbelowthecentroidalax is. If the beam supports an UDL of 6kN/m and Ec=38kN/mm^2 Estimate theinstantaneous deflection for the following stages
    1) Prestress + self weight of the beam
    2) (ii)Prestress+selfweightofthebeam+liveload

2. A post- tensioned concrete beam with a cable of 4 wires (total area = 600 mm^2) isstressed,forthedatagivenBT1tensionedwith1wireatatime.Thecablehaszeroeccentri city attheendsand100mm atthecenterandison aparaboliccurve.Thespan ofthebeamis10m. The cross - section is 200mm wide and 550mm deep. The wires are to be stressedfrom one end so that immediately after anchoring, the initial prestress of 940 N/mm2would be obtained. Compute the final design stress in steel after all the loss as:Coefficient of friction is 0.6, Coefficient for wave effect is 0.003, deformation and slip ofanchorage is 1.25mm, Es =210 klM/mm^2, Ec = 28 kN/mm^2 ,

Shrinkage of concrete is0.0002 and relaxation of stress in steel is 3% of initial stress.

COURSE OUTCOME 2:

1. A pretensioned T section has a flange width of 1200mm and 150mm thick. The widthand depth of the rib are 300mm and 1500mm respectively. The high tension steel has anarea of 4700mm2 and is located at an effective depth of 1600mm characteristic cubestrength of the concrete and the tensile strength. If the BT4 of steel are 40 and 1600Mparespectively; calculate the flexural strength of the section.

2. Thesupportsectionofprestressedconcretebeam,100mmwideby250mmdeep,isBT1 required to support an ultimate shear force of 80 KN. The compressive prestress atthecentroidalaxisis5N/mm^2. The characteristic cube strength of concrete is 40N/mm^2. The cover to the reinforcement is 50 mm. if the characteristic tensile strengthstirrups is 415 N/mm^2, design suitableshear reinforcement in the section using IS codeRecommendations.

COURSE OUTCOME 3:

1. A concrete beam having a rectangular cross section 150mm wide and 300mm deep isspan m towards the top at the support section. concentrated load of s of flection at thecenter of the span under prestress, dead load prestressed by a parabolic cable ofeccentricity 75mm at the center of the towards the soffit, and an eccentricity of 25mTheeffectiveforceinthecableis350kN.Thebeamsupportsthec20Kn atthecenterof the span in addition to theself weight. If the modulus elasticity of the concrete is38kN/m2 and the span is 8m, Evaluate, (i) Short term de and live load. (ii) Long termdeflectionassuming a loss ratio as 0.8 and creepcoefficient as 1.6.

2. A PSC beam 250mm wide and 650mm deep is subjected to an effective prestressingBT-1 force of 1360kN along the centroidal axis. The cable is placed symmetricallyover a mild steel anchor plate of area 150mm x 350mm. Design the end block. Takefck= 30N/mm^2 Assume initial prestressing force is 1.2 times the effective prestressingforce.

COURSE OUTCOME 4:

1. A precast pretensioned beam of rectangular section has a breadth of 100mm anddepth of 200mm. The beam with an effective span of 5m is prestressed by thetendons with their centroids coinciding with the bottom kern. The initial force inthe tendons is 150kN. The loss of prestress is 15%. The top flange width is400mm with the thickness of 40mm.If the composite beam supports a live load of7kN/m calculate the resultant stresses developed if the section is unpropped. M40 and M20 concrete are used for pretensioned and insitu concrete.

2. A continuous beam ABC (AB=BC=10m) is prestressed by a parabolic cablecarryinganeffectiveforceof200kN.ThecableprofileisshowninFig.Thebeamsupp orts dead load and live load of 0.24kN/m and 2.36 kN/mrespectively.Calculate the resultant moments developed in the beam and locate the pressureline.

COURSE OUTCOME 5:

1. DesignanoncylindricalPSCpipeof600mm internal diameter to withstand

aworkinghydrostaticpressureof1.05N/mm2using2.5mmHYSDstressesto1000N/mm^2 attransfer. Permissible maximum and minimum stresses inconcrete attransfer and service load are 14 N/mm^2 and 0.7 N/mm^2. The loss ratio is 0.75. Es =210kN/mm2 and Ec =35kN/mm^2

2. Examineanddesign a prestressed concrete pipe of internal diameter 900mm towithstandtheinternalpressureof0.8N/mm^2.Themaximumpermissiblecompressive stress in concrete is 18N/mm^{2}and no tensile stress is to be permitted.Modular ratio between steel and concrete is 5.8. Adopt 5mm diameter high tensilewireswhich canbe stressed to1100 N/mm^2. Expected lossof prestressis 25%.

COURSE CONTENTAND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNITI-INTRODUCTION–THEORYANDBEHAVIOUR		
1	Basic Principles of prestressing	1
2	Classification and types	1
3	Advantages over ordinary reinforced concrete	1
4	Materials – High strength concrete and high tensile steel	1
5	Methods of prestressing	1
6	Freyssinet and MagnelBlaton method	1
7	Analysis of sections for stresses by stress concept	1
8	Strength concept and load balancing concept, Loss of Prestress	2
UNIT II DESIGN FOR FLEXUREAND SHEAR		
1	Basic assumptions for calculating flexural stresses	1
2	Permissible stresses in steel and concrete as per IS1343 Code	1
3	Design of sections of Type Iand Type II pre-tensioned beams	2
4	DesignofsectionsofTypeIandTypeIIpost-tensionedbeams	2
5	Check for strength as per IS 1343 Code	1
6	Layout of cables in post-tensioned beams	1
7	Location of wires in pre-tensioned beams.	1
UNITIII DEFLECTION AND DESIGN OF ANCHOR AGEZONE		
1	Introduction	1
2	Short term deflections of uncracked members	1
3	Prediction of long term deflections due to creep and shrinkage	1
4	Check for serviceability limit state of deflection	1
5	Determination of anchorage zone stresses in post-tensioned beams by Magnel Method	1
6	Determination of anchorage zone stresses in post-tensioned beams by Guyon‘s method and IS1343 code	2
7	Design of anchorage zone reinforcement	2
UNITIV COMPOSITE BEAMS AND CONTINUOUS BEAMS		

1	Analysis and design of composite beams	2
2	Methods of achieving continuity in continuous beams	1
3	Analysis for secondary moments	2
4	Concordant cable and linear transformation	2
5	Calculation of stresses	1
6	Principles of design	1
UNITVTHEORYOFMISCELLANEOUSSTRUCTURES		
1	Introduction	1
2	Pipes	2
3	Partial prestressing	1
4	Definition	2
5	Methods of achieving partial prestressing	2
6	Merits and demerits of partial prestressing	1

21CE7703	STRUCTURAL HEALTH MONITORING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Concrete Technology
- Building Materials and Constructions

Objectives

1. To introduce the concepts involved in the assessment, evaluation and technical diagnosis of different structural systems of strategic importance.
2. To impart knowledge on both elementary and advanced applications of SHM with case studies

UNIT I	INTRODUCTION TO STRUCTURAL HEALTH MONITORING	9

Introduction -Necessity -Components -Challenges -Advantages - Components of SHM process - SHM issues applied to concrete structures -Level of uncertainties in SHM process

UNIT II	STRUCTURAL HEALTH MONITORING METHODS	9

Short term and long-term Monitoring -Local and Global Monitoring -Static and Vibration based SHM - SHM planning and Management - SHM Methods

UNIT III	DAMAGE IDENTIFICATION METHODS	9

Damage Identification -Visual Inspection -Comparison of damage identification methods -Non Destructive testing and Evaluation-Vibration based damage detection

UNIT IV	SENSOR NETWORKING	9

Sensor Technologies -Fibre optic sensors -Smart Sensing for SHM -Sensing requirements in special structures -Sensor requirements and Data Acquisition -Acquisition system and Networking for SHM - Wireless Sensor Networking -MEMS - Artificial Intelligence in SHM

UNIT V	APPLICATIONS OF STRUCTURAL HEALTH MONITORING	9

SHM layout design of offshore structures -SHM Design -Application of SHM in bridges, buildings and offshore structures -Application in structural control strategies -Future of SHM.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes
Upon completion of the course, the students will be able to:
CO1: Examine the fundamental ideas behind structural health monitoring and why it's necessary. **CO2:** Using SHM methodologies, conduct analyses on the static and dynamic characteristics of various materials **CO3:** Examine, by use of NDT, the ability to forecast damage in a variety of materials, **CO4:** Be acquainted about the role that sensors play in SHM procedures **CO5:** Implement SHM procedures in a variety of building types and configurations
Text Books
1.Balageas, D., Fritzen, C.P. and Gemes, A. eds., 2013. Structural health monitoring (Vol. 90). John Wiley & Sons. 2. Glisic, B. and Inaudi, D., 2012. Fibre optic methods for structural health monitoring. John Wiley & Sons.
Reference Books
1. Chandrasekaran, S. 2016. Offshore structural engineering: Reliability and Risk Assessment, CRC Press, Florida, ISBN:978-14-987-6519-0. 2.Chandrasekaran, S. 2017. Dynamic analysis and design of ocean structures, Springer, 2nd Ed., Singapore. Do, R., 2014. 3.Passive and active sensing technologies for structural health monitoring. University of California, San Diego. 4.Nagayama, T. and Spencer Jr, B.F., 2007. Structural health monitoring using smart sensors. Newmark Structural Engineering Laboratory. University of Illinois at Urbana-Champaign.
Web Recourses 1. https://nptel.ac.in/courses/114/106/114106046/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	1	-	-	-	1	1	1	-	1		
2	3	2	1	1	-	-	-	1	1	-	-	1		
3	3	2	1	1	-	-	-	1	1	-	-	1		
4	3	2	1	1	-	-	-	1	1	-	-	1		
5	3	2	1	1	-	-	-	1	1	-	-	-		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember					
Understand	50	50	50	50	50
Apply	50	50	50	50	50
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Provide some reasons why it's important for buildings to have their structural health monitored.
2. Describe the various degrees of unpredictability involved in the process of monitoring the structural health.

COURSE OUTCOME 2:

1. Differentiate Detailed monitoring of both the short term and the long term.
2. System to meet the needs frame a few strategies for checking the structural health.

COURSE OUTCOME 3:

1. Describe a few strategies for identifying damage, and then compare the various methods for identifying damage.
2. Explain in detail how you will employ a rebound hammer and an ultrasonic pulse velocity test on a damaged bridge deck slab.

COURSE OUTCOME 4:

1. Mention the function of strain rosette with neat sketch .
2. List few sensing systems in high rise buildings with its applications.

COURSE OUTCOME 5:

1. Briefly explain a case study on sensing system in a bridge.
2. Briefly explain a case study on sensing system in an off shore structure.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION TO STRUCTURAL HEALTH MONITORING		
1	Introduction, Necessity, Components, Challenges and Advantages of SHM	1
2	materials used-care and maintenance	2
3	Components of SHM process	2
4	SHM issues applied to concrete structures -	2
5	Level of uncertainties in SHM process	2
UNIT II STRUCTURAL HEALTH MONITORING METHODS		
1	Short term and long-term Monitoring	2
2	Local and Global Monitoring	2
3	Static and Vibration based SHM	2
4	SHM planning and Management	2
5	SHM Methods	1
UNIT III DAMAGE IDENTIFICATION METHODS		
1	Damage Identification	2
2	Visual Inspection	2
3	Comparison of damage identification methods	2
4	Non-Destructive testing and Evaluation	2
5	Vibration based damage detection	1

UNIT IV SENSOR NETWORKING		
1	Sensor Technologies	2
2	Fibre optic sensors	1
3	Smart Sensing for SHM	1
4	Sensing requirements in special structures	1
5	Sensor requirements and Data Acquisition	1
6	Acquisition system and Networking for SHM	1
7	Wireless Sensor Networking -MEMS	1
8	Artificial Intelligence in SHM	1
UNIT V APPLICATIONS OF STRUCTURAL HEALTH MONITORING		
1	SHM layout design of offshore structures	3
2	SHM Design -Application of SHM in bridges, buildings and offshore structures	2
3	Application in structural control strategies	2
4	Future of SHM.	2

21CE7704	INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATION	L	T	P	C
		3	0	0	3

Prerequisites for the course

- NIL

Objectives

At the end of this program the, student is expected to assess the dynamic properties of soil and various design parameters required for the design of machine foundation as well as design of foundation for various reciprocating machines.

UNIT I	INTRODUCTION	9

Vibration of elementary systems-vibratory motion-single degree freedom systemfree and forced vibration with and without damping

UNIT II	WAVES AND WAVE PROPAGATION	9

Elastic waves in rods of infinite length – Longitudinal and Torsional – Effect of end conditions - Longitudinal and torsional vibrations of rods of finite length – Wave Propagation in infinite, homogeneous isotropic and elastic medium – Wave propagation in elastic half space – Typical values of compress wave and shear wave velocity – Wave propagation due to Machine foundation – Surface wave – Typical values – Particle movements and velocity.

UNIT III	DYNAMIC PROPERTIES OF SOILS	9

Dynamic Properties of Soils - Dynamic stress – Strain characteristics – Principles of measuring dynamic properties –Laboratory Techniques – Field tests – Factors affecting dynamic properties – Typical values – Dynamic bearing capacity – Dynamic earth pressure

UNIT IV	DESIGN PROCEDURES	9

Design criteria -dynamic loads - simple design procedures for foundations under reciprocating machines - machines producing impact loads - rotary type machines

UNIT V	VIBRATION ISOLATION	9

Vibration isolation technique-mechanical isolation-foundation isolation-isolation by location-isolation by barriers- active passive isolation tests.

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand the theory and measurement of vibration.
CO2: Understand the concept of wave propagation in infinite medium and due to machine foundation.
CO3: Get knowledge on dynamic properties of soils and laboratory and field testing.
CO4: Design of foundation for different types of machines
CO5: Understand liquefaction, motion isolation and vibration control

Text Books

1. Swamisaran,"Soil Dynamics and Machine Foundations", Galgotia Publications Pvt. Ltd., 1999
2. S.Prakesh&V.K Puri, Foundation for machines, McGraw-Hill 1993
3. Srinivasulu, P &Vaidyanathan, Hand book of Machine Foundations, McGraw-Hill, 1996

Reference Books

1. KamaswaraRao., Vibration Analysis and Foundation Dynamics, Wheeler Publishing, New Delhi, 1998.
2. IS Code of Practice for Design and Construction of Machine Foundations, McGrew Hill, 1996.
3. Moore, P.J., Analysis and Design of Foundation for Vibration, Oxford and IBH, 2005
4. Steven L. Kramer, Geotechnical Earthquake Engineering, Prentice Hall, 1996.
5. IS Code 5249: 1992 (Reaffirmed 2006) Determination of Dynamic Properties of Soil - Method of Test Bureau of Indian Standards, New Delhi.
6. IS Code 2974: (Part 1) 1982 (Reaffirmed 2008) Code of Practice for Design and Construction of Machine Foundations – Foundation for Reciprocating Type Machines Bureau of Indian Standards, New Delhi.
7. IS Code 2974: (Part 2) 1980 (Reaffirmed 2008) Code of Practice for Design and Construction of Machine Foundations – Foundations for Impact Type Machines (Hammer Foundations) Bureau of Indian Standards, New Delhi.
8. IS Code 2974: (Part 3) 1992 (Reaffirmed 2006) Code of Practice for Design and Construction of Machine Foundations – Foundations for Rotary Type Machines (Medium and High Frequency) Bureau of Indian Standards, New Delhi.

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3		2									
2	2	1	2		3						2			
3	3	2		1	3						1			
4	1	2	3		3						2			
5	3	2		1	3						1			

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	30	30	30	30	30
Understand	30	30	30	30	30
Apply	40	40	40	40	40
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1.Write a note on Free Vibrations and Forced Vibrations. Starting from fundamentals, discuss the equations of motion for over damped, critically damped and under damped systems. 2. How did the idea of human rights protection developed? Explain.
2. Explain in detail about the damping system

COURSE OUTCOME 2:

1.What do you understand about wave propagation in elastic half space? Discuss the characteristics of body waves and surface waves with neat sketches.
2.Using Barkan's approach determine the coefficient of uniform compression, if a vibration test on a block 1.5mx0.75mx0.7m gave a resonance frequency of 20 Hz in the vertical direction. The mass of the oscillator used was 100 kg. The mass density of the test block material is 2400 kg/m.

COURSE OUTCOME 3:

1. Explain in detail the lab and field techniques used for measuring the dynamic properties.

2.Classify the machines based on the design criteria and operating systems. Discuss the need of dynamic analysis in soils and foundations

COURSE OUTCOME 4:

1. Write briefly about the following (i) Types of machines, and (ii)Types of machine foundations.
2.Discuss the principles of design of foundation for reciprocating machine with clear illustrations.

COURSE OUTCOME 5:

1.Discuss the degrees of freedom of rigid block foundation and explain the various modes of vibration of rigid block foundation with neat sketch.
2.What are the properties of the good vibrating isolation material? List out and describe the properties of any two vibration isolating materials.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATION	NO OF HOURS REQUIRED
	UNIT I BASIC CONCEPTS	
1	Introduction	1
2	Vibration of elementary systems-	1
3	Vibratory motion	1
4	Single degree freedom systemfree	1
5	Degree of Freedom – free and forced vibrations	1
6	Single degree freedom systemfree - with and without damping	2
7	Single degree freedom systemforced - with and without damping	2
	UNIT II WAVES AND WAVE PROPAGATION	
1	Elastic waves in rods of infinite length	1
2	Longitudinal and Torsional – Effect of end conditions	1
3	Longitudinal and torsional vibrations of rods of finite length	1
4	Wave Propagation in infinite, homogeneous isotropic and elastic medium	1
5	Wave propagation in elastic half space	1
6	Typical values of compressor wave and shear wave velocity	1

7	Wave propagation due to Machine foundation	1
8	Typical values – Dynamic bearing capacity	1
9	Dynamic earth pressure	1
UNIT III SOCIAL STRUCTURE AND PROBLEMS		
1	Dynamic Properties of Soils	1
2	Dynamic stress	1
3	Strain characteristics	1
4	Principles of measuring dynamic properties	1
5	Laboratory Techniques	1
6	Field tests	1
7	Factors affecting dynamic properties	1
8	Typical values	1
9	Dynamic bearing capacity – Dynamic earth pressure	1
UNIT IV THEORIES OF HUMAN RIGHTS		
1	Design criteria	1
2	Dynamic loads	1
3	Simple design procedures for foundations under reciprocating machines	3
4	Machines producing impact loads	2
5	Rotary type machines	2
UNIT V VIBRATION ISOLATION		
1	Vibration isolation technique	1

2	Mechanical isolation	1
3	Foundation isolation	2
4	Isolation by location	1
5	Isolation by barriers	2
6	Active passive isolation tests	2

21CE7705	PREFABRICATED STRUCTURES	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Construction Techniques and Concrete Technology

Objectives

1. To impart knowledge to students on modular construction.
2. To gain knowledge on industrialised construction method and design of prefabricated elements.

UNIT I	INTRODUCTION	9

Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems –
Production – Transportation – Erection.

UNIT II	PREFABRICATED COMPONENTS	9

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs –Wall panels – Columns – Shear walls

UNIT III	DESIGN PRINCIPLES	9

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in designbecause of joint flexibility – Allowance for joint deformation

UNIT IV	JOINT IN STRUCTURAL MEMBERS	9

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

UNIT V	DESIGN FOR ABNORMAL LOADS	9

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such asearthquakes, cyclones, etc., - Importance of avoidance of progressive collapse- case studies of prefabricated buildings.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Written Test	MCQ	Written Test

Outcomes

Upon completion of the course, the students will be able to:

CO.1 Identify the Basic Modules and Assemble Structural Methods in Prefabricated Buildings.
CO.2 Implement Prefabricated Components insulation techniques in buildings
CO.3 Structural Design for Prefabricated Construction Techniques.
CO.4 Elements of Structural Connections methods in buildings.
CO.5 Apply Load Calculation systems in buildings.

Text Books

1. CBRI, Building materials and components, India, 1990.
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction
and manufacturing", Academic Press Inc., 1994

Reference Books

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of
precast concrete, Netherland BetorVerlag, 2009

Web Recourses
http://www.brainkart.com/subject/Prefabricated-Structures_42/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	3	1	1		3		1			3		
2	3	2	3	1	1		3		1			3		
3	3	2	3	1	2		3		1			2		
4	3	2	3	2	1		3		2			2		
5	3	2	3	2	1		3		1		2			

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember					
Understand	30	20	20	20	20
Apply	20	30	30	30	30
Analyze	50	50	50	50	50
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1 Explain the process involved in production of prefabricated structures
2 What are the principles of prefabrication techniques and explain in detail and also mention its advantages and disadvantages

COURSE OUTCOME 2:

1 Explain the architectural aspects of shear walls also explain eight stages of construction of prefabricated structures.

2 Explain the performance of precast components

COURSE OUTCOME 3

1 Discuss the necessity of disuniting of structures and explain in detail with sketch.
2 Explain the problem in design because of joint flexibility. Discuss with regard to various location

COURSE OUTCOME 4:

1 Explain and sketch the different types of connections in precast elements.
2 Explain the joint technique and materials used in detail

COURSE OUTCOME 5:

1. List the IS codes to avoid progressive collapse in detail.
2. Describe progressive collapse, Explain its types in details

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	UNIT I - INTRODUCTION	
1	Need for prefabrication	1
2	Principles of Prefabrication	2
3	Materials used for prefabrication	2
4	Modular coordination – Standarization – Systems of prefabrication	2
5	Production – Transportation – Erection of precast structures	2
	UNIT II -PREFABRICATED COMPONENTS	
1	Behaviour of structural components	1
2	Large panel constructions	2
3	Construction of roof and floor slabs	2
4	Wall panels and columns	2
5	Shear walls	2

UNIT III -DESIGN PRINCIPLES		
1	Disuniting of structures	2
2	Design of cross section based on efficiency of material used	3
3	Problems in design because of joint flexibility	2
4	Allowance for joint deformation	2
UNIT IV JOINT IN STRUCTURAL MEMBERS		
1	Joints for different structural connections	2
2	Dimensions and detailing of column-to-column precast connection	2
3	Dimensions and detailing of column to beam precast connection	2
4	Dimensions and detailing of wall to slab precast connection	2
5	Design of expansion joints	1
UNIT V DESIGN FOR ABNORMAL LOADS		
1	Progressive collapse	2
2	Code provisions	2
3	Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc.,	3
4	Importance of avoidance of progressive collapse	2
5	Case studies of prefabricated buildings.	1

Professional Elective VI

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/ Domain
1	21CE7707	Economics and Business Finance for Civil Engineers	7	3	0	0	3	Business Management
2	21CE7708	Repair and Rehabilitation of Structures	7	3	0	0	3	Structural
3	21CE7709	Structural Dynamics and Earthquake Engineering	7	3	0	0	3	Structural
4	21CE7710	Intellectual Property Rights	7	3	0	0	3	Management
5	21CE7711	Architecture and Town Planning	7	3	0	0	3	Architecture
6	21CE7712	Environmental Impact Assessment	7	3	0	0	3	Environmental

21CE7707	ECONOMICS AND BUSINESS FINANCE FOR CIVIL ENGINEERS	L	T	P	C
		3	0	0	3

Prerequisites for the course

- NIL

Objectives

To sensitize the Engineering students to various aspects of Human Rights

UNIT I	INTRODUCTION	9

Basic Principles-Time value of money, Quantifying alternatives for decision making, Cash flow diagrams.

UNIT II	TIME VALUE OF MONEY	9

Equivalence- Single payment in the future (P/F, F/P), Present payment compared to uniform series payments (P/A,A/P),Future payment compared to uniform series payments (F/A,A/F), Arithmetic gradient, Geometric gradient.

UNIT III	COMPARISON OF ALTERNATIVES	9

Comparison of alternatives: Present, future and annual worth method of comparing alternatives, Rate of return, Incremental rate of return, Break-even comparisons, Capitalized cost analysis, Benefit-cost analysis.

UNIT IV	DEPRECIATION, INFLATION AND TAXES AND COST – ESTIMATING	9

Depreciation, Inflation, Taxes; Types of Estimates, Approximate estimates– Unit estimate, Factor estimate, Cost indexes, Parametric estimate, Life cycle cost.

UNIT V	EQUIPMENTECONOMICS AND FINANCIAL MANAGEMENT	9

Equipment costs, Ownership and operating costs, Buy/Rent/Lease options, Replacement analysis. Construction accounting, Chart of Accounts, Financial statements– Profit **Financial management** and loss, Balance sheets, Financial ratios, Working capital management.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand the basic concepts of human rights
CO2: Explain the duties and rights of individual and group
CO3: Analyze various problems in society and attempt to give solutions to eliminate such problems
CO4: Understand theories related to human rights
CO5: Explain various rights of disadvantaged people

Reference Books

1. Peterson,S.J.,"ConstructionAccountingandFinancialManagement",PearsonEducation,UpperSaddleRiver,NewJersey,2005.Ostwald, P. F.,
2. "Construction Cost Analysis and Estimating", Prentice Hall, Upper Saddle River, New Jersey, 2001.
3. Peterson, S.J., "Construction Accounting and Financial Management", Pearson Education, Upper Saddle River, New Jersey, 2005.
4. Peurifoy, R.L., Schexnayder, C.J. and Shapira,A., "Construction Planning, Equipment, and Methods, 7th ed., Tata McGraw-Hill, New Delhi, 2010.

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						3	1	3	3	2		2		
2						3	1	3	2	2		3		
3						3		3	3	2		3		
4						3		3	2	2		2		
5						3	1	3	3	2		2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	30	30	30	30	30
Understand	30	30	30	30	30
Apply	40	40	40	40	40
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Human rights resemble natural rights. Justify.
2. How did the idea of human rights protection developed? Explain.

COURSE OUTCOME 2:

1. Define geometric gradient
2. Explain the concept of time value of money.

COURSE OUTCOME 3:

1. Write any two advantages of break even analysis
2. Explain how the future method can be used for comparison of alternatives

COURSE OUTCOME 4:

1. List out the type of estimates
2. What is inflation? Explain how the effect of inflation will affect the future cost of an item

COURSE OUTCOME 5:

1. What is working capital management?
2. Discuss about various sources of long term financing.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	ECONOMICS AND BUSINESS FINANCE FOR CIVIL ENGINEERS	NO OF HOURS REQUIRED
	UNIT I INTRODUCTION	
1	Introduction	1
2	Basic Principles	2
3	Time value of money	2
4	Quantifying alternatives for decision making	2
5	Cash flow diagrams.	2
	Unit II TIME VALUE OF MONEY	
1	Equivalence	1
2	Single payment in the future (P/F, F/P)	2
3	Present payment compared to uniform series payments (P/A,A/P)	2
4	Future payment compared to uniform series payments (F/A,A/F)	2
5	Arithmetic gradient	1
6	Geometric gradient.	1
	UNIT III COMPARISON OF ALTERNATIVES	
1	Comparison of alternatives	1
2	Present, future and annual worth method of comparing alternatives	1
3	Rate of return	1

4	Incremental rate of return	1
5	Break-even comparisons	2
6	Capitalized cost analysis	2
7	Benefit-cost analysis.	1
UNIT IV DEPRECIATION, INFLATION AND TAXES AND COST –ESTIMATING		
1	Depreciation	1
2	Inflation, Taxes	1
3	Types of Estimates	1
4	Approximate estimates	1
5	Unit estimate	1
6	Factor estimate	1
7	Cost indexes	1
8	Parametric estimate	1
9	Life cycle cost.	1
UNIT V ECONOMICS AND BUSINESS FINANCE FOR CIVIL ENGINEERS		
1	Equipment costs	1
2	Ownership and operating costs	1
3	Buy/Rent/Lease options	1
4	Replacement analysis.	1
5	Construction accounting	1
6	Chart of Accounts	1

7	Financial statements	1
8	Profit Financial management and loss, Balance sheets	1
9	Financial ratios, Working capital management	1

21CE7708	REPAIR AND REHABILITATION OF STRUCTURES	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Concrete Technology
- Construction materials

Objectives

1. To acquire knowledge on understanding the properties of concrete, causes of its failure, effects and measures to repair and rehabilitate it
2. To understand the importance of maintenance and repair of civil engineering structures

UNIT I	DURABILITY OF CONCRETE STRUCTURES	9

Permeability of concrete- Sulphate attack – methods of control – durability of concrete in sea water- action of sewage – thermal properties of concrete – fire resistance – resistance to freezing and thawing – resistance to abrasion, erosion and cavitation.

UNIT II	DISTRESS IN CONCRETE STRUCTURES	9

Causes, effects and remedial measures- effects due to climate, temperature, chemicals, wear and erosion - design and construction errors - corrosion mechanism, effects of cover thickness and cracking - methods of corrosion protection, inhibitors, resistant steels, coatings, cathodic protection.

UNIT III	MAINTENANCE AND REPAIR STRATEGIES	9

Inspection, structural appraisal, economic appraisal- Diagnosis of distress – Procedure. Quality assurance – need- components- conceptual bases of quality assurance schemes.

UNIT IV	MATERIALS FOR REPAIR	9

Special concretes and mortars - special cements for accelerated strength gain - expansive cement - polymer concrete - sulphur infiltrated concrete - ferro-cement - fibre reinforced concrete - self-healing concrete - formed concrete - Fibre reinforced Polymers.

UNIT V	REPAIR TECHNIQUES	9

Rust eliminators and polymer coating for rebars during repair - foamed concrete - mortar and dry pack, prepack - vacuum concrete - gunite and shotcrete - epoxy injection - mortar repair for cracks - case studies on distress concrete structures and type of treatment done.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)

1. Descriptive written exam	1. Assignments 2.Quiz	1.Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand the factors affecting the durability of concrete structures

CO2: Identify the causes and effects of distress in concrete structures

CO3: Diagnose distress in concrete structures and suggest suitable maintenance and repair strategies

CO4: Choose suitable materials of repair related to the distress with case studies

CO5: Suggest suitable techniques of repair to distress structures with case studies

Text Books

1. Varghese.P.C Maintenance Repair and Rehabilitation & Minor works of building, Prentice Hall India Pvt Ltd. (2014).
2. Dension Campbell, Allen and, Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical Publications UK. (1991)
3. Allen R.T. and Edwards. S.C., "Repairs of Concrete Structures", Blakie and Sons, UK. (1997).
4. Ravishankar.K. Krishnamoorthy.T.S, Structural Health Monitoring, Repair And
5. Rehabilitation of Concrete Structures, Allied Publishers. (2004).

Reference Books

1. Shetty. M.S., "Concrete Technology – Theory and Practice", S.Chand Company, New Delhi. (2010)
2. Gambhir. M.L. "Concrete Technology", Tata McGraw Hill Publishing Co., New Delhi. (1998).
3. ACCE(I), Madurai Centre, "Workshop on cracks, corrosion and leaks", July (2003)
4. Dov Kominetzky. M.S.,-Design and Construction Failures, Galgotia, PublicationsPvt.Ltd. (2001)
5. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers. (2008).
6. Hand Book on "Repair and Rehabilitation of RCC Buildings"–Director General works CPWD, Govt of India, New Delhi. (2002)

Web Resources

1. https://nptel.ac.in/courses/105105213
2. https://archive.nptel.ac.in/courses/105/106/105106202/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	1	-	1		1					2	1	2	1
2	2	2	1	2		2					2	1	2	1
3	1	2	1	2		2	1				3	1	2	1
4	1	2	1	2		2	1				2	1	2	1
5	1	2	1	2		2	1				2	1	2	1

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	60	60	60	60	60
Apply	20	20	20	20	20
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Discuss the phenomenon of sulphate attack on concrete mentioning the methods to minimize the same
2. Differentiate between the terms Repair, Rehabilitation and Retrofitting
3. Define the term permeability. List the factors affecting permeability of concrete

COURSE OUTCOME 2:

1. Discuss the mechanism of corrosion in rebars and discuss the influencing factors
2. Mention if cover thickness is related to corrosion of rebars? if so how?
3. List the types of distress that are likely to affect a break water structure discussing the causes and effects

COURSE OUTCOME 3:

1. By means of a flow chart discuss the method of diagnosing distress in concrete structures
2. Which special concrete you would recommend for a concrete structure to be constructed in freezing climatic conditions and why? Also discuss the properties of such a concrete

COURSE OUTCOME 4:

1. Discuss the ferro cement technique in the repair of the structures
2. Explain the application of self-healing techniques in concrete structures

COURSE OUTCOME 5:

1. Explain the working principle of gunite and shotcrete
2. Take a RCC building for a case study on distress concrete structures. Also, explain type of treatment will you prefer for the distressed concrete structures

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - DURABILITY OF CONCRETE STRUCTURES		
1	Permeability of concrete	1
2	Sulphate attack – methods of control	1
3	Durability of concrete in sea water	1
4	Action of sewage	1
5	Thermal properties of concrete	1
6	Fire resistance	1
7	Resistance to freezing and thawing	1
8	Resistance to abrasion	1
9	Erosion and cavitation	1

Unit II DISTRESS IN CONCRETE STRUCTURES		
1	**Causes, effects and remedial measures**- effects due to climate	2
2	Temperature, chemicals, wear and erosion	1
3	Design and construction errors, corrosion mechanism	2
4	Effects of cover thickness and cracking	1
5	Methods of corrosion protection	1
6	Inhibitors, resistant steels	1
7	Coatings, cathodic protection	1
Unit III MAINTENANCE AND REPAIR STRATEGIES		
1	Inspection	1
2	Structural appraisal	1
3	Economic appraisal	1
4	Diagnosis of distress – Procedure	2
5	Quality assurance – need	1
6	Quality assurance –components	1
7	Quality assurance - conceptual bases of quality assurance schemes.	2
Unit IV MATERIALS FOR REPAIR		
1	Special concretes and mortars	1
2	Special cements for accelerated strength gain	1
3	Expansive cement	1

4	Polymer concrete	1
5	Sulphur infiltrated concrete	1
6	Ferro-cement	1
7	Fibre reinforced concrete, self-healing concrete	2
8	Formed concrete, Fibre reinforced Polymers	1
Unit V REPAIR TECHNIQUES		
1	Rust eliminators	1
2	Polymer coating for rebars during repair,	1
3	Foamed concrete, mortar and dry pack, prepack	1
4	Vacuum concrete	1
5	Gunite and shotcrete	1
6	Epoxy injection, mortar repair for cracks	1
7	Case studies on distress concrete structures and type of treatment done	1

21CE7709	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Fundamentals of Mathematics
- Knowledge of basic Sciences

Objectives

1. To enable students to apply fundamental laws and basic concepts of single and multiple degree of freedom system in dynamic vibration.
2. To introduce the concepts of seismic-resistant design and provides minimum standards for use in building design to maintain public safety in an extreme earthquake.

UNIT I	VIBRATION AND DAMPING	9

Simple Harmonic Motion-Longitudinal Vibrations Equation of motion- 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 – Free and forced vibration of damped and undamped structures – Response to harmonic forces and periodic forces.

UNIT II	TWO DEGREES OF FREEDOM	9

Free vibration: Principal modes of vibration and equation of motion for two degree of freedom-Two degrees of freedom for torsional system-Vibrations of undamped Two degrees of freedom. F**orced vibration**: Forced Vibrations-Undamped forced vibration for two degrees of freedom – Orthogonality Principle. Eigen values and Eigenvectors (Natural frequencies and mode shapes) for two degree of freedom system.

UNIT III	MULTI DEGREE OF FREEDOM SYSTEM	9

Equation of motion of multi degree of freedom-Stiffness, mass and damping matrices. Influence Coefficient- problems-Modal co-ordinates. Introduction of modal analysis-Matrix Method – Rayleigh Method and Stodala's method-Natural frequencies and mode shapes-Modal analysis – damped undamped free vibration.

UNIT IV	BASICS OF EARTHQUAKE AND RESPONSE SPECTRUM	9

Earthquake causes and its effect on built structures-Earthquake resistant provisions in masonry building.Response of structure subjected to Random Vibrations-Problems on Tripartite response spectrum-Seismic coefficient method and Dynamic Analysis-Ductile detailing of reinforced concrete beams, Columns & shear wall

UNIT V	EARTHQUAKE RISK ASSESSMENT PROCEDURE	9

Seismic failure of RC and masonry failure-DSHA - Case studies PSHA - completeness analysis-Rapid Visual Screening method, Push Over Analysis-Estimation of Dynamic soil properties-Field Testing -Seismic cross hole, refraction, MASW test-Seed and Idriss method. Principle of seismic instruments-Transducers for velocity and acceleration measurements-Inductive Transducer LVDT-Cathode Ray Oscilloscope, frequency measuring instruments-XY Plotter- Strip Chart

recorder

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (61 arks)
1. Descriptive written exam	1.Assignments 2.Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Explain the concepts of single degree of freedom with free vibration

CO2: Analyze the two degrees of freedom free and forced vibration with harmonic excitation.

CO3: Analyze the Multi degree of freedom with free and forced vibration.

CO4: Identify hazards to buildings caused by earthquakes

CO5: Explain the principle of seismic measuring instruments

Text Books

1. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. (2007).
2. Hemant Kumar Sharma, & GiridharilalAgarwal, "Earthquake Resistant Building construction", Vedha publications New Delhi. (2001).
3. Alan Williams, Ph.D. Williams Alan, "Siesmic Design of Buildings and Bridges: For Civil and Structural Engineers". (1997)
4. Hurty.W.C, Rubinstein.M.F," Dynamic of Structure", Prentice Hall of India Pvt Ltd. New Delhi. (2015)
5. Manicka Selvam K., "Elementary Structural Dynamics", Dhanpatrai and sons, New Delhi. (2001).
6. Mario Paz, "Structural Dynamics: Theory and Computation", CBS Publications, New Delhi. (1994)
7. PankajAgarwal, Manish Shrikhande , "Earthquake resistant design of structures", Prentice Hall, India. (2006).

Reference Books

1. Anil K.Chopra, "Dynamics of Structures: Theory and Applications to Earthquake Engineering", Prentice Hall, Englewood Cliffs, New Jersy, Second Edition. (2001).
2. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, McGraw Hill International Edition, (1995)
3. Jai Krishna, Chandrasekaran.A.R., and Brijesh Chandra, Elements of Earthquake Engineering, South Asia Publishers. (1994).
4. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, Mc Graw – Hill Book Company (1986)
5. IS: 13920:1993, "Code of Practice for ductile detailing of Reinforce Concrete- Structures subjected to Seismic forces",
6. IS 4326:1993 Code of Practice for "Earthquake Resistant Design and Construction of

Buildings.
7. IS: 1893: 2000 – Indian Standard Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi.
8. IS: 13828: 1993 – Improving Earthquake Resistance of Low Strength Masonry Buildings.
9. IS: 13827: 1993. - Improving Earthquake Resistance of Earthen Buildings,1993.

Web Resources

1. https://nptel.ac.in/courses/105106151
2. https://nptel.ac.in/courses/105101004

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	-	-	-	-	1	-	1	2	-
2	2	3	1	-	-	-	-	-	-	1	-	1	3	-
3	2	3	1	-	-	-	-	-	-	1	-	1	3	-
4	2	2	1	-	-	2	-	-	-	1	1	1	2	-
5	2	2	1	-	-	2	-	-	-	1	1	1	3	-

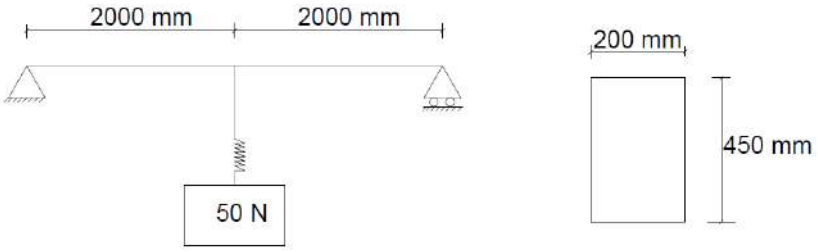
BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	20	20	20	20	20
Apply	50	50	50	50	50
Analyze	20	20	20	20	20
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Calculate the natural frequency of the system shown in fig1. The mass of the beam is negligible in comparison to the suspended mass. E =2x 10^5 N / mm2



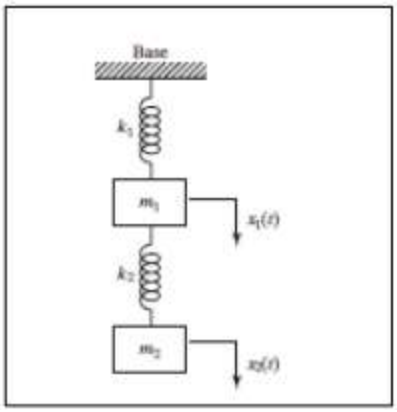
2. Write the expression for damped harmonic excitation.

COURSE OUTCOME 2:

1. Explain coordinate coupling of two degree of freedom system and derive amplitude
2. Explain coordinate coupling of two degree of freedom system and derive amplitude ratio and frequencies.

COURSE OUTCOME 3:

1. Calculate the natural frequency and mode shape as shown in Figure below for m^1 = 1000kg, m^2 = 5000kg. Given k^1=3.09x10^6 N/m, k^2 = 3x10^5 N/m.



2. Calculate the vertical deflection of cantilever beam is subjected to free end mass(m) using Rayleigh method. Using function of x= 3y/L^3 ($Lx^2/2 - x^3/6$).

COURSE OUTCOME 4:

1. Define centre of mass and Centre of rigidity.
2. What is meant by 'torsional effect' on buildings?

COURSE OUTCOME 5:

1. Explain the working principle and application of Cathode Ray Oscilloscope
2. Write short notes on soil-structure interaction

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - VIBRATION AND DAMPING		
1	Simple harmonic motion	1
2	Longitudinal Vibrations Equation of motion	1
3	Idealization of structure as Single Degree of Freedom (SDOF)system	1
4	Formulation of equation of motion for various SDOF system	1
5	D' alemberts principles	1
6	Effect of damping	1
7	Free and forced vibration of damped and undamped strucures	1
8	Forced vibration of damped and undamped structures	1
9	Response to harmonic forces and periodic forces	1
Unit II TWO DEGREES OF FREEDOM		
1	Principal modes of vibration and equation of motion for two degree of freedom	2
2	Two degrees of freedom for torsional system	2
3	Vibrations of undamped Two degrees of freedom	1
4	Forced Vibrations-Undamped forced vibration for two degrees of freedom	1
5	Orthogonality Principle	1
6	Eigen values (Natural frequencies and mode shapes) for two	1

	degree of freedom system	
7	Eigenvectors (Natural frequencies and mode shapes) for two degree of freedom system	1
Unit III MULTI DEGREE OF FREEDOM SYSTEM		
1	Equation of motion of multi degree of freedom	2
2	Stiffness, mass and damping matrices	2
3	Influence Coefficient- problems -Modal co-ordinates	1
4	Introduction of modal analysis	1
5	Matrix Method –Rayleigh Method and Stodala's method	1
6	Natural frequencies and mode shapes	1
7	Modal analysis – damped undamped free vibration.	1
Unit IV BASICS OF EARTHQUAKE AND RESPONSE SPECTRUM		
1	Earthquake causes and its effect on built structures	1
2	Earthquake resistant provisions in masonry building	1
3	Response of structure subjected to Random Vibrations	2
4	Problems on Tripartite response spectrum	1
5	Seismic coefficient method and Dynamic Analysis	1
6	Ductile detailing of reinforced concrete beams, Columns & shear wall	1
7	Ductile detailing of reinforced concrete Columns	1
8	Ductile detailing of reinforced concrete shear wall	1
Unit V EARTHQUAKE RISK ASSESSMENT PROCEDURE		

1	Seismic failure of RC and masonry failure-DSHA	1
2	Case studies PSHA	1
3	Completeness analysis-Rapid Visual Screening method	1
4	Push Over Analysis-Estimation of Dynamic soil properties	1
5	Field Testing -Seismic cross hole, refraction, MASW test- Seed and Idriss method	1
6	Principle of seismic instruments-Transducers for velocity and acceleration measurements	1
7	Inductive Transducer LVDT-Cathode Ray Oscilloscope, frequency measuring instruments	1
8	XY Plotter- Strip Chart recorder	1

21CE7710	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

Prerequisites for the course

- NIL

Objectives

1. To give an idea about IPR, registration and its enforcement.

UNIT I	INTRODUCTION	9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II	REGISTRATION OF IPRs	9

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III	AGREEMENTS AND LEGISLATIONS	9

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV	DIGITAL PRODUCTS AND LAW	9

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V	ENFORCEMENT OF IPRs	9

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 arks)
1.Descriptive written exam	1.Assignments 2. Quiz	1. Descriptive written exam

Course Outcomes

Upon completion of the course, the students will be able to:
CO1: Understand the concepts of IPR and various property rights **CO2:** Explain the aspects of registration of IPS **CO3**: Explain the concepts of agreements and legislations **CO4:**Explain the concepts of digital products and law **CO5:**Manage Intellectual Property portfolio to enhance the value of the firm.
Reference Books
1. . Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012. 2. Prabuddha Ganguli,"Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011. 3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						3	1	3	3	2		2		
2						3	1	3	2	2		3		
3						3		3	3	2		3		
4						3		3	2	2		2		
5						3	1	3	3	2		2		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	30	30	30	30	30
Understand	30	30	30	30	30
Apply	40	40	40	40	40
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Define Intellectual Property.
2. How did the idea of human rights protection developed? Explain.

COURSE OUTCOME 2:

1. Differentiate between a trade name and business name.
2. Explain the roles and responsibilities of US patent and trade mark office

COURSE OUTCOME 3:

1. Discuss the issues of copyright ownership.
2. Explain in detail about process involved in searching a paten

COURSE OUTCOME 4:

1. What are the new developments in patent Law? Explain.
2. Illustrate in detail about International Patent Law.

COURSE OUTCOME 5:

1. Discuss about false advertising?
2. Discuss the legalities involved in protecting against unfair competition.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	INTRODUCTION	NO OF HOURS REQUIRED
	UNIT I BASIC CONCEPTS	
1	Introduction to IPRs	1
2	Basic concepts and need for Intellectual Property	1
3	Patents, Copyrights	1
4	Geographical Indications	1
5	IPR in India and Abroad	1

6	Genesis and Development – the way from WTO to WIPO	1
7	TRIPS, Nature of Intellectual Property	1
8	Industrial Property, technological Research	1
9	Inventions and Innovations – Important examples of IPR.	1
UNIT II REGISTRATION OF IPRS		
1	Meaning and practical aspects of registration of Copy Rights	2
2	Trademarks	2
3	Patents	2
4	Geographical Indications	1
5	Trade Secrets and Industrial Design registration in India and Abroad	2
UNIT III AGREEMENTS AND LEGISLATIONS		
1	International Treaties and Conventions on IPRs	1
2	TRIPS Agreement	1
3	PCT Agreement	1
4	Patent Act of India	1
5	Patent Amendment Act	1
6	Design Act	1
7	Trademark Act	2
8	Geographical Indication Act.	1
UNIT IV DIGITAL PRODUCTS AND LAW		

1	Digital Innovations and Developments as Knowledge Assets	1
2	IP Laws	1
3	Cyber Law	1
4	Digital Content Protection	1
5	Unfair Competition	1
6	Meaning and Relationship between Unfair Competition and IP Laws	2
7	Case Studies.	2
UNIT V ENFORCEMENT OF IPRs		
1	Infringement of IPRs	2
2	Enforcement Measures	2
3	Emerging issues	2
4	Case Studies.	3

21CE7711	ARCHITECTURE AND TOWN PLANNING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Construction techniques
- Highway Engineering

Objectives

1. To give exposure about architectural principles in the design of buildings.
2. To demonstrate competency in the technical, practical skills of landscape architecture and their role in investigating complex and innovative ideas

UNIT I	INTRODUCTION TO ARCHITECTURE	9

Introduction - Fundamentals concepts of architecture – Principles of planning – Qualities, Strength, Refinement, Repose, Scale, Proportion, Colour, Solids and Voids and Symmetry

UNIT II	INTERIOR DECORATIONS	9

Interior Planning and treatment - Use of natural and synthetic building materials – Thermal and Acoustical materials - Lighting & illumination

UNIT III	PLANNING AND CONCEPTS OF TOWN PLANNING	9

Planning Surveys - Importance of Climate topography, drainage and water supply in the selection of site for the development - Residential - Commercial – Industrial – Public – Transportation, Basic amenities and services – Concept of preparing of master plan for large scale.

UNIT IV	FUNCTIONAL PLANNING OF BUILDINGS	9

Occupancy classification of buildings-general requirements of site and building – building codes and rules – licensing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings – the process of identifying activity areas and linkages

UNIT V	COUNTRY PLANNING AND HOUSING	9

Plan implementation: Town planning legislation and municipal acts – Planning control development schemes – Urban financing – Land acquisitions – Slum clearance schemes. Examples of planned cities and housing in India – Applications of Remote Sensing and GIS in town planning

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)

1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand the various elements of architecture and principles of orientation,
CO2: Choose the various building materials as per the interior design aspects.
CO3: Make plan for the buildings by considering our Indian climatic conditions
CO4: Solve the problem that is coming in Town Planning level.
CO5: Know various rules and regulation of town planning and development authorities

Text Books

1. Pramar. V.S. ―Design fundamental in Architecture‖, Somiya Publications Pvt. Ltd., New Delhi, 1997.

2. Biswas Hiranmay, ―Principles of Town Planning and Architecture‖ ,VAYU Education of India, New Delhi., 1st ed., 2012

3. G.K. Hiraskar, ―Fundamentals of Town Planning‖, Dhanpat Rai Publications Pvt.Ltd., New Delhi.,2012

Reference Books

1. Arthur Gallion., Simon Eisner., ―The Urban Pattern: City Planning and Design‖, Charotar Publishing House Pvt. Ltd., Gujarat, 5th ed., 1986.

2. S.C.Rangwala, K.S.Rangwala and P.S.Rangwala, ‗Town Planning‖, Charotar Publishing House, 18th ed., 2003.

3. National Building Code of India, SP7 (Group 1) Bureau of Indian Standards, New Delhi, 2017

Web Resources

1. https://nptel.ac.in/courses/124107007

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-	-	-	1	2	1	-	-	-	2	1		3
2	2	-	-	-	1	2	1	-	-	-	2	1		3
3	2	-	-	-	1	2	1	-	-	-	2	1		3
4	2	-	-	-	1	2	1	-	-	-	2	1		3
5	2	-	-	-	1	2	1	-	-	-	2	1		3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	10	10	10	10	10
Apply					
Analyze	80	80	80	80	80
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Briefly describe the characteristics of Roman architecture with examples
2. What are the factors affecting architectural development?
3. Discuss the creative principles in architecture.

COURSE OUTCOME 2:

1. Write about the architectural features of any one building in your campus?
2. List down the factors influencing architecture into 3 major categories? Write about each factor with an example.

COURSE OUTCOME 3:

1. Explain different types of surveys to be conducted for a town planning scheme.
2. Describe the Concept of preparing a master plan for large scale.

COURSE OUTCOME 4:

1. Describe the functional planning of a residential building.
2. Explain the classification of buildings based on occupancy.
3. Explain the importance of building codes and rules.

COURSE OUTCOME 5:

1. Write an essay about urban problems you face in today's life & ways and means of solving those problems.
2. Explain the Applications of Remote Sensing and GIS in town planning

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	ARCHITECTURE AND TOWN PLANNING	NO OF HOURS REQUIRED
	UNIT I INTRODUCTION TO ARCHITECTURE	
1	Introduction	1
2	Fundamentals concepts of architecture	2
3	Principles of planning	1
4	Qualities, Strength, Refinement	2
5	Repose, Scale, Proportion,	1
6	Colour, Solids and Voids and Symmetry	2
	UNIT II INTERIOR DECORATIONS	
1	Introduction	1
2	Interior Planning and treatment	2
3	Use of natural and synthetic building materials	2
4	Thermal and Acoustical materials	2
5	Lighting & illumination	2
	UNIT III PLANNING AND CONCEPTS OF TOWN PLANNING	
1	Planning Surveys	1
2	Importance of Climate topography, drainage and water supply in the selection of site for the development	2
3	Residential - Commercial – Industrial	2

4	Public – Transportation	1
5	Basic amenities and services	1
6	Concept of preparing a master plan for a large scale.	2
UNIT IV FUNCTIONAL PLANNING OF BUILDINGS		
1	Occupancy classification of buildings	1
2	General requirements of site and building	2
3	Building codes and rules	1
4	Licensing of building works.	1
5	Functional planning of building such as residential, institutional, public, commercial, industrial buildings	2
6	The process of identifying activity areas and linkages	2
UNIT V COUNTRY PLANNING AND HOUSING		
1	Plan implementation:	1
2	Town planning legislation and municipal acts	2
3	Planning control development schemes	1
4	Urban financing	1
5	Land acquisitions	1
6	Slum clearance schemes.	1
7	Examples of planned cities and housing in India	1
8	Applications of Remote Sensing and GIS in town planning	1

21CE7712	ENVIRONMENTAL IMPACT ASSESSMENT	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Environmental science and Engineering

Objectives

1. To expose the students to the need, methodology, documentation and usefulness of environmental impact assessment and to develop the skill to prepare environmental management plan.
2. To provide knowledge related to the broad field of environmental risk assessment, important processes that control contaminant transport and tools that can be used in predicting and managing human health risks.

UNIT I	INTRODUCTION	9

Historical development of Environmental Impact Assessment (EIA). Environmental Clearance- EIA in project cycle. legal and regulatory aspects in India – types and limitations of EIA –EIA process screening – scoping - terms of reference in EIA- setting – analysis – mitigation. Cross sectoral issues –public hearing in EIA- EIA consultant accreditation.

UNIT II	IMPACT INDENTIFICATION AND PREDICTION	9

Matrices – networks – checklists – cost benefit analysis – analysis of alternatives – expert systems in EIA. prediction tools for EIA – mathematical modelling for impact prediction – assessment of impacts – air – water – soil – noise – biological –– cumulative impact assessment

UNIT III	SOCIO-ECONOMIC IMPACT ASSESSMENT	9

Socio-economic impact assessment - relationship between social impacts and change in community and institutional arrangements. factors and methodologies- individual and family level impacts. communities in transition-rehabilitation

UNIT IV	EIA DOCUMENTATION AND ENVIRONMENTAL MANAGEMENT PLAN	9

Environmental management plan - preparation, implementation and review – mitigation and rehabilitation plans – policy and guidelines for planning and monitoring programmes – post project audit – documentation of EIA findings – ethical and quality aspects of environmental impact assessment

UNIT V	CASE STUDIES	9

Mining, power plants, cement plants, highways, petroleum refining industry, storage & handling of hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and construction projects

	Total Periods	45

Suggestive Assessment Methods		
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 arks)**
1.Descriptive written exam	1.Assignments 2. Quiz	1.Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Apply the principle of limit state design for concrete pipe design
CO2: Do structural design of Water tanks
CO3: Design the water treatment plant Structures.
CO4: Design the components of wastewater treatment plant structures.
CO5: Apply the knowledge of structural design to various environmental

Reference Books

1. Canter, L.W., "Environmental Impact Assessment", McGraw Hill, New York. 1996
2. Lawrence, D.P., "Environmental Impact Assessment – Practical solutions to recurrent problems", Wiley-Inter science, New Jersey. 2003
3. World Bank –Source book on EIA
4. Cutter, S.L., "Environmental Risk and Hazards", Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
5. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York, 1996.
6. K. V. Raghavan and A A. Khan, "Methodologies in Hazard Identification and Risk Assessment", Manual by CLRI, 1990.
7. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012.

Web Resources

NPTEL

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						2	3	3					2	
2	3	2	3	2	2			3	2			1		2
3		2	3	2	2			3	2			1		2
4			3		3	2	2	2	2	1	1			2
5	3			2				2						

OPEN ELECTIVE I

S.No	Course Code	Course Name	Semester	L	T	P	C	Offered by
1	21CE5801	Fundamentals of CIVIL Engineering (Except EEE)	5	3	0	0	3	CIVIL
2	21CE5802	Elements of environmental Engineering	5	3	0	0	3	CIVIL
3	21CE5803	Geo-technical Engineering	5	3	0	0	3	CIVIL
4	21CE5804	Building Services	5	3	0	0	3	CIVIL
5	21CE5805	Elements of Transportation Engineering	5	3	0	0	3	CIVIL

21CE5801	FUNDAMENTALS OF CIVIL ENGINEERING (Except EEE)	L	T	P	C
		3	0	0	3

Objectives

1. Civil engineering fundamentals should be imparted to all engineering students, as routine work requires interaction with civil engineers. Therefore, all essential aspects of civil engineering are presented globally as civil engineering elements.

UNIT I	CIVIL ENGINEERING MATERIALS	9

Traditional Materials – Mortars – Concrete- Metals As Building Materials- Miscellaneous Building Materials

UNIT II	BUILDING CONSTRUCTION	9

Building Planning- Foundations- Super Structures- Dampness And Its Prevention- Cost Effective Construction Techniques In Mass Housing Schemes

UNIT III	SURVEYING	9

Introduction To Surveying- Linear Measurements And Chain Surveying-Compass Surveying - Plane Table Surveying -Level And Levelling -Modern Tools Of Surveying

UNIT IV	MAPPING AND SENSING	9

Mapping And Contouring - Areas And Volumes- Remote Sensing And Its Applications

UNIT V	DISASTER RESISTANT BUILDING	9

Disaster Resistant Buildings- Disaster Management And Planning- Indian Standard Codes

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Investigate the type of building material based on its strength, durability and applications.
CO2: Plan and classify the type of building components and various construction technologies.
CO3: Explore the types of traditional surveying methods.
CO4: Distinguish the modern surveying tools and types of mapping.
CO5:design a building to resist disaster following IS codes.

Text Books

1. "Basic Civil Engineering" by S.S. Bhavikatti, New age international P(Ltd..,) Publisher 2015.

2. "Basic Civil Engineering", Ramamrutham. S, Dhanpat Rai Publishing Co. (P) Ltd. (2013)

3. "Basic Civil Engineering", Seetharaman S. Anuradha Agencies, (2005)

Reference Books

1. "Basic Civil and Mechanical Engineering", Shanmugam G and Palanichamy M S, Tata McGraw Hill Publishing Co., New Delhi, (1996)

Web Resources

1. https://onlinecourses.nptel.ac.in/noc22_ce42/preview
2. https://onlinecourses.nptel.ac.in/noc21_ce10/preview

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	1	-	-	-	-	1	1	1	-	1		
2	3	3	1	-	-	-	-	1	1	1	-	1		
3	3	3	1	-	-	-	-	1	1	1	-	-		
4	3	3	1	-	-	-	-	1	1	1	-	-		
5	3	3	1	-	-	-	-	1	1	1	-	1		
6	3	3	1	-	-	-	-	1	1	1	-	1		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	80	80	80	80	80
Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Discuss the geological classification of stones.
2. Briefly explain physical and chemical classification of rocks.
3. Discuss the characteristics of good building stones.
4. Explain any three tests performed on stones to find their properties.

COURSE OUTCOME 2:

1. Write explanatory note on cost effective construction techniques.
2. What are the minimum standards recommended for low cost housing?
3. What is the suitable approach to cost effective mass housing works?

COURSE OUTCOME 3:

1. What is surveying? State its objects and uses.
2. Distinguish between geodetic surveying and plain surveying.
3. Explain the terms topographical surveying and cadastral surveying.
4. What are the fundamental principles of surveying? Explain briefly

COURSE OUTCOME 4:

1. Write short notes on (a) Remote sensing (b) Geographical Information System.

2. List various area of application of remote sensing.

COURSE OUTCOME 5:

1. What is IScode ? Discuss their importance.
2. Write thenames of any four IS codes used for building design and construction. Briefly describe them

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I –CIVIL ENGINEERING MATERIALS		
1	Traditional Materials	1
2	Mortars	2
3	Concrete	2
4	Metals As Building Materials	2
5	Miscellaneous Building Materials	2
Unit II BUILDING CONSTRUCTION		
1	Building Planning	1
2	Foundations	2
3	Super Structures	2
4	Dampness And Its Prevention	2
5	Cost Effective Construction Techniques In Mass Housing Schemes	2
Unit III SURVEYING		
1	Introduction To Surveying	1
2	Linear Measurements And Chain Surveying	1
3	Compass Surveying	2
4	Plane Table Surveying	2

5	Level And Levelling	2
6	Modern Tools Of Surveying	1
Unit IV MAPPING AND SENSING		
1	Mapping And Contouring	3
2	Areas And Volumes	3
3	Remote Sensing And Its Applications	3
Unit V DISASTER RESISTANT BUILDING		
1	Disaster Resistant Buildings	3
2	Disaster Management And Planning	3
3	Indian Standard Codes	3

21CE5802	ELEMENTS OF ENVIRONMENTAL ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Environmental and Sustainable Engineering

Objectives

1. To enable students to apply fundamental laws and basic concepts of Environmental Engineering.
2. To provide exposure on the elements of Environmental Engineering.

UNIT I	INTRODUCTION TO ENVIRONMENTAL ENGINEERING	9

Definition, scope and importance of environment – need for public awareness; Basics of - Environmental pollution, Types of waste, Water and wastewater treatment.

UNIT II	WATER AND WASTEWATER TREATMENT	9

Water treatment Objectives – Unit operations and processes in surface water treatment - Characteristics of sewage; Primary treatment; Secondary treatment.

UNIT III	AIR POLLUTION MANAGEMENT	9

Structure and composition of Atmosphere – Sources and classification of air pollutants - Effects ofair pollutants on human health, vegetation & animals - Ambient Air Quality and Emission Standards – Air Pollution Indices.

UNIT IV	MUNICIPAL SOLID WASTE MANAGEMENT	9

Sources and types of municipal solid wastes- factors affecting waste generation rate and characteristics - Elements of integrated solid waste management - Elements of Municipal Solid Waste Management Plan.

UNIT V	HAZARDOUS WASTE MANAGEMENT	9

Types and Sources of hazardous wastes - Need for hazardous waste management - Hazardous Characteristics – TCLP tests; labeling and handling of hazardous wastes.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand the fundamentals of Environmental Engineering.

CO2: Understand the primary and secondary treatment methods.
CO3: Understand and analyze the air pollutants in the atmosphere.
CO4: Identify the elements of municipal solid waste management.
CO5: Understand about the hazardous waste and its management methods.

Text Books

5. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
6. Hilary Theisen and Samuel A, Vigil, George Tchobanoglous, Integrated Solid Waste Management, McGraw- Hill, New York, 1993.

Reference Books

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.

2. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York, 2001.

Web Resources

1. https://archive.nptel.ac.in/courses/127/105/127105018/
2. https://onlinecourses.nptel.ac.in/noc22_ch45/preview

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2					2	3	1				2		2
2	2					2	3	1				2		2
3	2					2	3	1				2		2
4	2					2	3	1				2		2
5	2					2	3	1				2		2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	50	50	50	50	50
Apply	30	30	30	30	30

Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Why public awareness regarding environment is necessary for the management of resources?
2. What types of pollution are affecting the environment? Explain.

COURSE OUTCOME 2:

1. What characteristics of sewage are necessary to design a treatment unit?
2. What components are used in the primary treatment units of sewage treatment plants?

COURSE OUTCOME 3:

1. How the air pollutants present in the atmosphere affects humans, plants and animals?
2. What are the sources of air pollutants? How will you classify the air pollutants?

COURSE OUTCOME 4:

1. Write about the factors affecting waste generation rates.
2. What is mean by integrated solid waste management? Explain about the elements of it?

COURSE OUTCOME 5:

1. Write about the Toxicity Characteristic Leaching Procedure (TCLP) test?
2. Write about the procedures for labelling and handling of hazardous waste?

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION TO ENVIRONMENTAL ENGINEERING		
1	Definition, scope and importance of environment	2
2	need for public awareness	1
3	Basics of - Environmental pollution,	2

4	Types of waste	2
5	Water and wastewater treatment	2
Unit II WATER AND WASTEWATER TREATMENT		
1	Water treatment Objectives	1
2	Unit operations in surface water treatment	2
3	Unit processes in surface water treatment	2
4	Primary treatment	2
5	Secondary treatment	2
Unit III AIR POLLUTION MANAGEMENT		
1	Structure and composition of Atmosphere	2
2	Sources and classification of air pollutants	2
3	Effects of air pollutants on human health, vegetation & animals	2
4	Ambient Air Quality and Emission Standards	2
5	Air Pollution Indices	1
Unit IV MUNICIPAL SOLID WASTE MANAGEMENT		
1	Sources and types of municipal solid wastes	2
2	factors affecting waste generation rate and characteristics	2
3	Elements of integrated solid waste management	2
4	Elements of Municipal Solid Waste Management Plan	3
Unit V HAZARDOUS WASTE MANAGEMENT		
1	Types and Sources of hazardous wastes	2

2	Need for hazardous waste management	2
3	Hazardous Characteristics	2
4	TCLP tests	1
5	labeling and handling of hazardous wastes	2

21CE5803	GEOTECHNICAL ENGINEERING	L	T	P	C
		3	1	0	3

Prerequisites for the course

- Knowledge of Basic Sciences, Strength of Materials, Basic Geology, Fluid Mechanics

Objectives

The students will be able to

1. To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification

2. Understand various types of foundation, methods of soil exploration and field tests on soil, planning and preparation of soil investigation programme.

3. Learn the importance and fundamentals of ground improvement techniques for for measuring field parameters by using traditional and modern methods involved in civil construction.

UNIT I	SOIL CLASSIFICTION	9

Soil formation and nature of soils- Phase diagrams - Basic definitions and inter- relationships – Index properties of soils – Classification based on BIS

UNIT II	SOIL STRUCTURE AND CLAY MINERALOGY	9

Soil Structure and Clay Mineralogy Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, adsorbed water. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite and their application in Engineering

UNIT III	COMPACTION AND CONSOLIDATION	9

COMPACTION -Definitions, Difference between compaction and consolidation, Compaction mechanism and proctor tests, field compactions methods, factors affecting compaction

CONSOLIDATION – Consolidation – Fundamental definitions – Spring analogy – Terzaghi's one-dimensional consolidation theory - Assumptions, Limitations and applications

UNIT IV	FOUNDATION OF SOIL	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-wash boring and rotary drilling-depth of boring, field penetration tests: SPT, SCPT, DCPT.

UNIT V	INTRODUCTION TO GROUND MODIFICATION	9

Need and objectives, identification of soil types, in situ and laboratory tests to characterize problematic Soils, mechanical, hydraulic, physical, chemical, electrical, thermal methods and their applications

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Classify Soil based on the index properties.
CO2: Explain the structure of different structures and mineralogy of clay.
CO3: Differentiate the concepts of compaction and consolidation in soil strengthening
CO4: Predict the site investigation methods and sampling the soil for testing.
CO5: Explain various ground improvement techniques and their applications.

Text Books

1.B.C.Punmia,SoilMechanicsandFoundations,LaxmiPublicationsPvt.Ltd.,NewDelhi,2005.
2. B.N.D.NarasingaRao,Soil Mechanics and Foundation Engineering,WileyIndiaPvt.Ltd.,New Delhi,20153. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.
3. Soil mechanics and Foundation Engineering" K. R. Arora Standard Publisher Distribution 1997
4. Purushothama Raj, P. ―Ground Improvement Techniques‖, Tata McGraw Hill Publishing Company, New Delhi, 2007.
5. Joseph E Bowles, ―Foundation Analysis and Design‖, McGraw Hill Companies. Inc., New York, 1997.

Reference Books

1.BrajaM.Das, Principles of Geotechnical Engineering, Thomson Brooks/Cole,Australia, 8th sEdition,2015.
2. KarlTerzaghi,SoilMechanicsinEngineeringPractice,3rdedition,JohnWiley&Sons,Inc, 1995
3. "Foundation Analysis and Design" Joseph E.Bowels. McGraw-Hill International Editions, Fifth Edition, 1997
4. Joseph E Bowles, ―Foundation Analysis and Design‖, McGraw Hill Companies. Inc., New York, 1997.

Web Recourses

1. ttps://www.kobo.com/us/en/ebook/introduction-to-soil-mechanics. 2.
2.https://easyengineering.net/geotechnical-engineering-book-by-c-venkatramaiah/ 3.
3.https://nptel.ac.in/courses/105/103/105103097/

4. https://nptel.ac.in/courses/105108075

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2		3										
2	3	3											2	
3	3	3												
4	1	1		2	1							1	2	1
5	3		3		3		3							3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	30	30	30	30	30
Understand	30	30	30	30	30
Apply	40	40	40	40	40
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Represent Fig 1 as a phase diagram by volume. What nature of soil does this phase diagram represent?

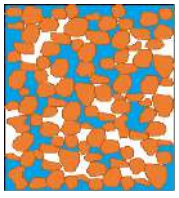


Fig 1

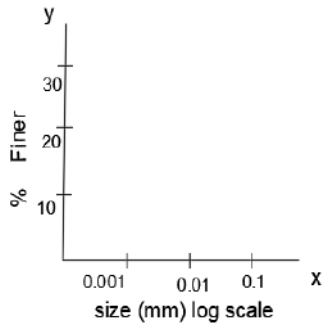
2. i) What phases among **ICE, SOIL , WATER , AIR** will the following soils possess? Represent your answers in phase diagrams by volume.

1. Partially saturated soil
2. Fully saturated soil
3. Dry soil
4. Frozen soil

(ii) A. Why are graphs drawn on log scale?

B. Fig 3 represents the grain size distribution curve. Draw lines representing the following in this graph

A. Well graded soil
B. Uniformly graded soil
C. Gap graded soil



COURSE OUTCOME 2:

1. What is thixotropy and remoulding of clay
2. Explain in details the different tests on clay

COURSE OUTCOME 3:

1. Differentiate compaction and consolidation
2. (i)Write short notes on consolidation and classify it based on stress history

(ii) Tabulate the process of consolidation at different levels and explain the following

(i) the parameters which decrease in magnitude during consolidation

(ii) the parameters which increase in magnitude during consolidation

(iii) the parameters which remains constant during consolidation

COURSE OUTCOME 4:

1. Describe with neat sketch different types of drilling adopted in soil exploration works.

2. Explain static cone penetration test in detail.

COURSE OUTCOME 5:

1. What are the various Geo technical problem faced with Black cotton soil , Laterite Soil and Alluvial Soil.

2. Explain in brief the various methods of Ground Improvement.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	UNIT I SOIL CLASSIFICTION	
1	Introduction	1
2	Origin of Soil	1
3	Soil formation	1
4	Nature of soils	1
5	Phase diagrams	1
6	Basic definitions	1
7	Inter- relationships	1
8	Index properties of soils	1
9	Classification based on BIS	1
	Unit II SOIL STRUCTURE AND CLAY MINERALOGY	
1	Soil Structure and Clay Mineralogy - Introduction	1
2	Mineralogy Single grained, honey combed, flocculent	1
3	Dispersed structures	1
4	Valence bonds, Soil-Water system	1
5	Adsorbed water	1
6	Common clay minerals in soil	1

7	Structure of Clay Minerals	1
8	Kaolinite, Illite and Montmorillonite	1
9	Application in Engineering	1
	Unit III COMPACTION AND CONSOLIDATION	
1	Introduction to compaction and consolidation	1
2	Compaction – Definitions, Difference between compaction and consolidation	1
3	Compaction mechanism and proctor tests	1
4	Field compactions methods, factors affecting compaction	1
5	Consolidation – Fundamental definitions	1
6	Spring analogy	1
7	Terzaghi's one- dimensional consolidation theory	1
8	Assumptions, Limitations and applications	
9	Tutorial	
	UNIT IV FOUNDATION OF SOIL	
1	Introduction	1
2	Types of foundation	1
3	Factors affecting the selection of type of foundations	1
4	Steps in choosing types of foundation based on soil condition	1
5	Objectives and planning of exploration program	1
6	Methods of exploration	1

7	Wash boring and rotary drilling-depth of boring	1
8	Field penetration tests: SPT	1
9	SCPT and DCPT	1
UNIT V INTRODUCTION TO GROUND MODIFICATION		
1	Need and objectives	1
2	Identification of soil types	1
3	In situ and laboratory tests to characterize problematic Soils	1
4	Mechanical methods and their applications	1
5	Hydraulic methods and their applications	1
6	Physical methods and their applications	1
7	Chemical methods and their applications	1
8	Electrical methods and their applications	1
9	Thermal methods and their applications	1

21CE5804	BUILDING SERVICES	L	T	P	C
		3	0	0	3

Prerequisites for the course

Nil

Objectives

6. To execute the building services for creating human comfort in the buildings.
7. To select appropriate vertical communication services necessary for building
8. To enhance the HVAC system integrated with fire safety and sanitation service.
9. To enhance employability withthe skills required for building service industries.

UNIT I	OVERVIEW OF BUILDING SERVICES	9

Introduction to building services, Classification of buildings as per national building code. Different types of building services i.e. HVAC (Heat, Ventilation and Air Conditioning), escalators and lifts, fire safety, rain waterharvesting, lightening, acoustics, sound insulation and electric installation.Role and responsibility of Building Service Engineer, Introduction toBMS (Building ManagementServices), Role of BMS.

UNIT II	MODES OFVERTICALCOMMUNICATION	9

Objectives and modes of VerticalCommunication in building.

Lifts: Different types of lifts and its uses, Component parts of Lift- Lift well, Travel, Pit, Hoist Way,Machine, Buffer, Door Locks,Suspended Rope, Lift Car, LandingDoor, Call Indicator, Call Push.

Escalators: Different types ofEscalators and its Uses. Components of escalators. Safety measures.

Ramp: Necessity, designconsideration, gradient calculation,layout and Special features required for physically handicapped andelderly.

UNIT III	FIRE SAFETY	9

Safety against fire in residential andpublic buildings (multi-storeyedbuilding), National Building Code provision for fire safety, Fireresistant construction, procedures forcarrying out fire safety inspections of existing buildings. Provisions for evacuation. Causes offire in building. Fire detecting and various extinguishingsystem.

UNIT IV	WATERSUPPLY ANDSANITATIONSERVICES	9

Importance of plumbing, AHJ(Authority Having Jurisdiction)approval, Plumbing Terminology andfixtures. Different types of plumbing fixtures,shapes/ sizes, capacities, situationand where used, Traps, Interceptors.System of plumbing for buildingwater supply: sources of water,storaHge of water, hot and cold watersupplysystem.System of plumbing for buildingdrainage: types of drainage system.

UNIT V	LIGHTING, VENTILATION, AND ACOUSTICS.	9

Concept of lighting, types oflighting (natural and artificial), factorsinfluencing the brightness of room,factors affecting selection of artificiallighting, installation of light (direct,half-direct, indirect, half-indirect anddirect-indirect), Lampselection as per room sizes.

Concept of ventilation, necessity andtypes of ventilation, Overview of AirConditioning system for building.

Building Acoustic, Objectives,acoustic Control in a building, acousticmaterial (porous absorber and cavityresonator)

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Identify the building services for the requisite functional requirements.
CO2: Estimate the space requirements for vertical communication services.
CO3: Propose the fire safety requirements for residential and multi-storeyed buildings.
CO4: Devise the water supply and sanitation system for buildings.
CO5: Execute the relevant system of lighting, ventilation and acoustics for buildings.

Text Books

1.Akhil Kumar Das., —Principles of Fire SafetyEngineering: UnderstandingFire and Fire Protection, PHI Learning Pvt. Ltd, New Delhi 2014.
2.Deolalikar, S. G., —Plumbing Design andPractice, McGraw-Hill, NewDelhi, 2017.
3. Mantri, Sandeep., - The A to Z of PracticalBuilding Construction anditsManagement.,SatyaPrakashan, New Delhi, Edition 2017.

Reference Books

1. National Building Code Part 1, 4, 8, 9||, Bureau of Indian Standards, New Delhi.
2. IS Code 12183 (Part 1):1987Code ofpracticefor plumbing in multistoried buildings||, Bureau of Indian Standards, New Delhi.
3. 2008 Uniform plumbing code — India(UPC-I)||, Bureau of Indian Standards, New Delhi.

Web Recourses

1. https://nptel.ac.in/courses/105102176
2. https://archive.nptel.ac.in/courses/112/107/112107208/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	-	3	-	2	-	-	-	1	1	1		3
2	1	-	1	2	1	1	-	1	1	-	-	1		3
3	1	-	-	3	2	-	1	-	1	-	-	1		3
4	1			2	1		2	1						3
5	1			2	1		3	1				1		3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	25	25	25	25	50
Understand	25	25	25	25	50
Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Classify the building based on the basis of the given type of occupancy with reference to the provisions of National Building Code.

2. Explain the salient characteristics of BMS required for the given type of building.

COURSE OUTCOME 2:

1. Explain the safety measures required for installing the Escalators and Lifts in the 4 storied educational building.
2. Suggest the specifications for the elevator required in the 5 storied commercial building with justification.

COURSE OUTCOME 3:

1. Select the relevant system of fire safety for the given structure with justification.
2. Explain the national building code requirements of providing Fire protection system for the multi-storeyed building.

COURSE OUTCOME 4:

1. Explain the significance of AHJ approval in laying the plumbing system in the given type of building.
2. Suggest the relevant plumbing system for the apartment building building of 10 storied with justification.

COURSE OUTCOME 5:

1. Describe the methods used for the ventilation purposes in the multispecialty hospital building.
2. Explain the relevant method of acoustic treatment for the theaterbuildingstructure.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - OVERVIEW OF BUILDING SERVICES		
1	Introduction to building services, Classification of buildings as per national building code	1
2	Different types of building services i.e. HVAC (Heat, Ventilation and Air Conditioning)	1
3	Escalators and lifts, fire safety, rain waterharvesting	2
4	Lightening, acoustics, sound insulation and electric installation.	2
5	Role and responsibility of Building Service Engineer	1
6	Introduction toBMS (Building ManagementServices)	1
7	Role of BMS.	1
Unit II MODES OF VERTICAL COMMUNICATION		
1	Objectives and modes of VerticalCommunication in building.	1
2	Lifts: Different types of lifts and its uses,	1
3	Component parts of Lift- Lift well, Travel, Pit, Hoist Way,Machine, Buffer, Door Locks,Suspended Rope, Lift Car, LandingDoor, Call Indicator, Call Push.	2
4	Escalators: Different types ofEscalators and its Uses.	1
5	Components of escalators. Safety measures.	1
6	Ramp: Necessity, designconsideration, gradient calculation,layout.	2
7	Special features required for physically handicapped andelderly.	1
Unit III FIRE SAFETY		

1	Safety against fire in residential andpublic buildings (multistoriedbuilding)	1
2	National Building Code provision for fire safety	2
3	Fireresistant construction, procedures forcarrying out fire safety inspections of existing buildings.	2
4	Provisions for evacuation.	1
5	Causes offire in building.	1
6	Fire detecting and various extinguishingsystem.	2
Unit IV WATER SUPPLY AND SANITATION SERVICES		
1	Importance of plumbing, AHJ (Authority Having Jurisdiction) approval,	1
2	Plumbing Terminology and fixtures	2
3	Different types of plumbing fixtures, shapes/ sizes, capacities, situation and where used, Traps, Interceptors.	2
4	System of plumbing for building water supply: sources of water	1
5	Storage of water, hot and cold water supply system.	1
6	System of plumbing for building drainage: types of drainage system.	2
Unit V LIGHTING, VENTILATION, AND ACOUSTICS.		
1	Concept of lighting, types oflighting (natural and artificial),	1
2	Factorsinfluencing the brightness of room,	2
3	Factors affecting selection of artificiallighting, installation of light	1
4	Lampselection as per room sizes.	1

5	Concept of ventilation, necessity andtypes of ventilation,	2
6	Overview of AirConditioning system for building.	1
7	Building Acoustic, Objectives,acoustic Control in a building, acousticmaterial (porous absorber and cavityresonator)	2

21CE5805	ELEMENTS OF TRANSPORTATION ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Nil

Objectives

1. To provide a coherent development to the students for the courses in sector of Engineering like Transportation Engineering etc.
2. To give an experience in the implementation of Engineering concepts which are applied in field of Transportation Engineering

UNIT I	INTRODUCTION	9

Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute.

UNIT II	HIGHWAY DEVELOPMENT AND PLANNING	9

Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4th twenty year road development plans and Policies, Present scenario of road development in India - vision 2021.

UNIT III	RAILWAY PLANNING	9

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- gradient, super elevation- Level Crossings.

UNIT IV	AIRPORT PLANNING	9

Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area.

UNIT V	HARBOUR ENGINEERING	9

Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Harbour 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 Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)

1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand the concept and modes of transportation.
CO2: Study the highway planning.
CO3: Plan and design the railway track components.
CO4: Plan and design the components of airport.
CO5: Plan and design a harbour.

Text Books

1. G.V Rao, —Principles of Transportation and Highway Engineering||, Tata McGraw Hill Co, New Delhi, 2005.S.K.Khanna, C.E.G.Justo, —Highway Engineering||, New Chand & Bros,Roorkee,
2. Saxena Subhash C and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi, 2010
3. Khanna S K, Arora M G and Jain S S, "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2012.
4. Bindra S P, "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi, 2013

Reference Books

1. G.V Rao, —Principles of Transportation and Highway Engineering||, Tata McGraw Hill Co, New Delhi, 2005.
2. Rangwala, "Railway Engineering", Charotar Publishing House, 2013.
3. Rangwala, "Airport Engineering", Charotar Publishing House, 2013.
4. Rangwala, "Harbor Engineering", Charotar Publishing House, 2013.

Web Recourses

1. https://www.elsevier.com/books/transportation-engineering/teodorovic/978-0-12-803818-5
2. https://nptel.ac.in/courses/105107123

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3		2		2		2	1			2		2
2	3	3	3		3		3		3					2
3	3		3		3		3		3			3		2
4	2		3						3	2	2	3		2

5			3		3		3		3		3			2

BLOOMS LEVEL ASSESSMENT PATTERN

Blooms Category	Cat 1	Cat 2	Fat 1	Fat 2	End Sem exam
Remember	50	50	50	50	50
Understand	50	50	50	50	50
Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain IRC, Central road fund
2. Explain the recommendations made by Jayakar committee.

COURSE OUTCOME 2:

1. Describe salient features of second 20 year plan.
2. Give classification of highways according to Nagpur road plan. Give formula of Length of NH, SH and MDR as per Nagpur road plan

COURSE OUTCOME 3:

1. What is meant by permanent way. Explain the basic requirements of an permanent way
2. What is meant by joints in rails. Explain the various types of joints in railway

COURSE OUTCOME 4:

1. What are the basic pattern of Runway Configuration ? Discuss Each pattern in all the Details.
2. Discuss in detail the factors affecting the choice of the Selection of Site for an Airport

COURSE OUTCOME 5:

1. Write a detailed note on break water. Explain all essential Aspects.
2. Enumerate the various types of Harbors with neat Sketch

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION		
1	Importance of transportation	1
2	Different modes of transportation and comparison	1
3	Characteristics of road transport Jayakar committee recommendations	1
4	implementation	1
5	Central Road Fund	2
6	Indian Roads Congress	2
7	Central Road Research Institute.	1
Unit II HIGHWAY DEVELOPMENT AND PLANNING		
1	Road types and classification	1
2	road patterns	1
3	planning surveys, master plan	1
4	saturation system of road planning	1
5	phasing road development in India	1
6	problems on best alignment among alternate proposals Salient Features of 3rd and 4th twenty year road development plans	1
7	Policies	1

8	Present scenario of road development in India	1
9	vision 2021	1
Unit III RAILWAY PLANNING		
1	Elements of permanent way	1
2	Rails, Sleepers, Ballast, rail fixtures and fastenings	1
3	Selection of gauges	2
4	Track Stress	2
5	coning of wheels	1
6	creep in rails	1
7	defects in rails	1
8	Route alignment surveys, conventional and modern methods	1
9	Level Crossings	1
Unit IV AIRPORT PLANNING		
1	Air transport characteristics	1
2	airport classification	2
3	ICAO	1
4	airport planning- Site selection typical Airport Layouts,	2
5	Case Studies	2
6	parking and Circulation Area	1

Unit V HARBOUR ENGINEERING		
1	Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides	2
2	Harbour Layout and Terminal Facilities	2
3	Coastal Structures	2
4	Inland Water Transport	1
5	Wave action on Coastal Structures and Coastal Protection Works	1
6	Coastal Regulation Zone, 2011	1

OPEN ELECTIVE II

S.No	Course Code	Course Name	Semester	L	T	P	C	Offered by
1	21CE6801	Remote sensing & GIS	6	3	0	0	3	CIVIL
2	21CE6802	Construction Materials	6	3	0	0	3	CIVIL
3	21CE6803	Water Resources Engineering	6	3	0	0	3	CIVIL
4	21CE6804	Waste Management	6	3	0	0	3	CIVIL
5	21CE6805	Sustainable Construction Methods	6	3	0	0	3	CIVIL

21CE6801	REMOTE SENSING & GIS	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Nil

Objectives

1. To introduce the students to the basic concepts and principles of various components of remote sensing and to provide an exposure to GIS and its practical applications in civil engineering

UNIT I	INTRODUCTION TO REMOTE SENSING	12

Energy Sources–Components of Remote Sensing Principles –electromagnetic radiation– Remote Sensing platforms– Spectrum- Block body radiation – planks law – Stefan – Boltzmann law – satellites classification – Airborne space borne, TIR and microwave sensors, satellite – Payload description of important Earth Resources and Meteorological satellites.

UNIT II	IMAGEINTERPRETATION	8

Elements of visual image interpretation concepts of digital image processing image Rectification and Restoration –Image enhancement & Image classification –Application of Remote sensing in Civil Engineering.

UNIT III	PHOTOGRAMMETRY	8

Geometric elements of a vertical photograph–Ortho photos & Flight planning- Stereoscopic plotting instruments.

UNIT IV	INTRODUCTIONTOGIS	9

Introduction to GIS – history of development of GIS – elements of GIS, Computer hardware– Software, Data Input, Verification, data storage and database management and output

UNIT V	GISANALYSISANDAPPLICATIONS	8

Map Overlay – Vector and raster data model, mapping concept – Definitions–Map projections-types of map projections – map analysis, overlay operation Errors and quality control–Current issues and Trends in GIS application in Civil Engineering –Potential study of groundwater using GIS.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Identifythebasicremotesensingconcepts andits characteristics

CO2: Implement the photogrammetric concepts and fundamentals of Air photo Interpretation.

CO3: Interpret and analyze the image

CO4: Study on GIS and analyze the data using DBMS.

CO5: Apply remote sensing and GIS techniques for various engineering related problems

Text Books

1. Bhatta.B, -RemoteSensingandGIS, Oxford UniversityPress,SecondEdition 2011
2. AnjiReddy.M., -Remote SensingandGeographical information systems,BS Publications 2013

Reference Books

1. Lillesand, T.M.&Kiefer R.W., -Remote Sensing and image interpretation, John ziley &Sons (Asia), Newyork, 2015
2. BurroughP.A., Principle of Geographical Information Systems for land resource sassessment, ClarendonPress, Oxford UniversityPress, 2004.
3. Clarke Parks & Crane, Geographic Information Systems & Environmental Modeling, Prentice-Hall ofIndia2005.
4. Wolf, P.R., -Elements of Photo grammetry with Applications in GIS**||**, Mc.Graw-Hill International BookCompany,4th ed., 2014.

Web Recourses

1. https://nptel.ac.in/courses/105108077

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2	3	3		3		3		3	3		
2					3		3		3		3	2		
3					3		3		3		3			
4	2	3	3	3	3		3				3	2	2	3
5		3	2	3	3		3	3			3	2		3

BLOOMS LEVEL ASSESSMENT PATTERN

Blooms Category	Cat 1	Cat 2	Fat 1	Fat 2	End Sem exam
Remember	15	15	30	30	20
Understand	85	65	70	70	60
Apply		20			20
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain electromagnetic energy with earth surface features in terms of reflected transmitted and absorbed energy.
2. Explain the types of resolutions in remote Sensing with examples.

COURSE OUTCOME 2:

1. Discuss in detail about multispectral image classification
2. Explain in detail about the visual interpretation of satellite imageries

COURSE OUTCOME 3:

1. Explain in detail about the geometric elements of vertical photographs.

2. Assume that two road intersections shown on a photograph can be located on a 1:25000 scale topographic map. The measured distance between the intersections is 52.2 mm on the map and 96.3 mm on the photograph. (a) What is the scale of the photograph? (b) At that scale, what is the length of a fence line that measures48.9 mm on the photograph?

COURSE OUTCOME 4:

1. Explain in detail about the UTM projection system.
2. Explain in detail on maps and its classification.

COURSE OUTCOME 5:

1. Write about Map analysis in GIS.
2. Write about the integrated data analysis.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION TO REMOTE SENSING		
1	EnergySources	1
2	Components of Remote Sensing Principles	1
3	Electromagnetic radiation	1
4	Remote Sensing platforms	1
5	Spectrum	1
6	Block body radiation	2
7	Airborne space borne, TIR and microwave sensors	2
8	satellite	2
9	Payload description of important Earth Resources and Meteorological satellites.	1
Unit II IMAGEINTERPRETATION		
1	Elements of visual imageinterpretation	2

2	ConceptsofdigitalimageprocessingimageRectificationandRestoration	2
3	Image enhancement	1
4	Image classification.	1
5	Application of Remote sensing in Civil Engineering.	2
Unit III PHOTOGRAMMETRY		
1	Geometric elements of a vertical photograph	2
2	Ortho photo	2
3	Flight planning	2
4	Stereoscopic plotting instruments.	2
Unit IV INTRODUCTIONTOGIS		
1	Introduction to GIS	1
2	History of development of GIS	1
3	Elements of GIS	1
4	Computer hardware	1
5	Software	1
6	Data Input	1
7	Verification	1
8	Data storage and database management	1
9	output	1
Unit V GISANALYSISANDAPPLICATIONS		

1	Map Overlay	1
2	Vector and raster model, mapping concept	2
3	Map projections	1
4	Map analysis	2
5	Overlay operation Errors and quality control	1
6	Current issues and Trends in GIS application in Civil Engineering	1
7	Potential study of ground water usingGIS.	1

21CE6802	CONSTRUCTION MATERIALS	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Building Materials and Construction

Objectives

1. To introduce students to various materials commonly used in civil engineering construction and their properties.

UNIT I	STONES – BRICKS – CONCRETE BLOCKS	9

Stone as building material – 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.

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	9

Concrete – Ingredients – Manufacturing Process – Batching plants –Mixing – Transporting – Placing – Compaction of concrete –Curing and finishing – Ready mix Concrete – Mix specification.

UNIT IV	TIMBER AND OTHER MATERIALS	9

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 – Bitumens.

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– Geomembranes and Geotextiles for earth reinforcement.

	Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO601.1 Compare the properties of most common and advanced building materials.
CO601.2 Understand the typical and potential applications of lime, cement and aggregates
CO601.3 Know the production of concrete and also the method of placing and making of concrete elements.
CO601.4 Understand the applications of timbers and other materials
CO601.5 Understand the importance of modern material for construction.

Text Books

1. Varghese.P.C, "BuildingMaterials", PHI Learning Pvt. Ltd, New Delhi, 2015.

2. Rajput. R.K., "EngineeringMaterials", S. Chand and Company Ltd., 2008.

3. Gambhir.M.L., "ConcreteTechnology", 3rd Edition, Tata McGraw Hill Education, 2004

4. Duggal.S.K., "BuildingMaterials", 4th Edition, New Age International, 2008.

Reference Books

1. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.

2. Gambhir. M.L., & Neha Jamwal., "Building Materials, products, properties and systems",

Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.

3. IS456 - 2000: Indian Standard specification for plain and reinforced concrete, 2011

4. IS4926 - 2003: Indian Standard specification for ready–mixed concrete, 2012

5. IS383 - 1970: Indian Standard specification for coarse and fine aggregate from natural

Sources for concrete, 2011

6. IS1542-1992: Indian standard specification for sand for plaster, 2009

7. IS 10262-2009: Indian Standard Concrete Mix Proportioning –Guidelines, 2009

Web Recourses

1. https://nptel.ac.in/courses/105106206

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	-	-	-	1	2	-	-	-	-	2	1		3
2	3	-	-	-	1	2	-	-	-	-	2	1		3
3	3	-	-	-	1	2	-	-	-	-	2	1		3
4	3	-	-	-	1	2	-	-	-	-	2	1		3
5	3	-	-	-	1	2	-	-	-	-	2	1		3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	10	10	10	10	10
Apply					
Analyze	80	80	80	80	80
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. (i)Enumerate the characteristics to be considered in selection of stones.

   (ii) Explain in detail about classification of bricks.

2. Describe various tests to be conducted for testing of conventional bricks.

COURSE OUTCOME 2:

1. What are the tests to be conducted for cement? Explain any four tests in detail.
2. Explain the following test with sketches
   i. Field test on coarse aggregate

ii. Abrasion Resistance test on course aggregate
iii. Shape test on coarse aggregate.
iv. Crushing strength of aggregate
v. Impact test of aggregate (Write any two test)

COURSE OUTCOME 3:

1. Discuss about the testing of fresh concrete with neat sketches in the civil engineering field.

2. Briefly discuss about manufacturing process of concrete

COURSE OUTCOME 4:

1. Explain in detail the application of various types of industrial timber in building construction
2. Write notes on
   1. Paints,
   2. Varnishes
   3. Distempers

   and also explain their applications.

COURSE OUTCOME 5:

1. Write notes on
   i)Glass
   ii)Refractories
   iii)Geomembrane

2. Write notes on

   i. Various application of laminar composites
   ii. Various application of geotextiles

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I STONES – BRICKS – CONCRETE BLOCKS		
1	Stone as building material - Criteria for selection of stones	1
2	Test on stones	1

3	Deterioration and Preservation of stone work	1
4	Bricks - Classification	1
5	Manufacturing of clay bricks	1
6	Tests on bricks – Compressive Strength – Water Absorption, Efflorescence	2
7	Bricks for special use – Refractory bricks	1
8	Concrete blocks – Lightweight concrete blocks	1
UNIT II LIME – CEMENT – AGGREGATES – MORTAR		
1	Lime - Preparation of lime mortar	1
2	Cement **-** Ingredients, Manufacturing Process - Dry & Wet Process	1
3	Types and Grades of cement, Properties of cement & cement mortar	1
4	Hydration, Compressive strength, Tensile strength, Fineness, Soundness and Consistency, Setting Time of cement	2
5	Aggregate- Fine aggregate-River sand- Crushed stone sand-Properties.	1
6	Coarse Aggregate - Crushing strength- Impact strength - Flakiness Index-Elongation Index	2
7	Abrasion Resistance - Grading	1
UNIT III CONCRETE		
1	Concrete **-** Ingredients, Manufacturing Process	2
2	Batching- Volume & Weigh Batching, Mixing - Hand & Machine Mixing, Transporting	2
3	Placing - Compaction of concrete	1

4	Curing - Methods, Finishing of Concrete	1
5	Ready Mix Concrete	1
6	Mix Specification	2
UNIT IV TIMBER AND OTHER MATERIALS		
1	Timber- Market Forms -Industrial Timber	1
2	Plywood - Veneer - Thermocol	2
3	Panels of laminates – Steel	2
4	Aluminium and Other Metallic Materials – Composition –	1
5	Aluminium composite panel – Market forms – Mechanical treatment - Paints	2
6	Varnishes, Distempers, Bitumen	1
UNIT V MODERN MATERIALS		
1	Glass	1
2	Ceramics - Sealants for joints	2
3	Fibre Reinforced Plastic	1
4	Clay products –Refractories	1
5	Composite Materials- Types of Composites- Applications of laminar composites	2
6	Fibre Textiles	1
7	Geomembranes and Geotextiles for earth reinforcement.	2

21CE6803	WATER RESOURCE ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Environmental sciences
- Water Supply Engineering

Objectives

1. To impart knowledge on spatial and temporal distribution of water available in any region.
2. To disseminate the knowledge on hydrologic estimates for river and reservoir management.
3. To emphasize the need for water resources planning and management.

UNIT I	INTRODUCTION	9

Climate and weather- meteorological and hydrological parameters - water-budget equation - water resources survey - consumptive and non-consumptive water use - water scarcity and its impacts - water resources planning - national water policy.

UNIT II	FUNDAMENTALS OF HYDROLOGY	9

Rain Water Harvesting: Introduction, Rain Water Harvesting, Roof Water Harvesting, Water Harvesting by Ponds, Water Quality Consideration.

UNIT III	ANALYSIS OF STREAM FLOW	9

Components of stream flow - stream gauging - selection of site for stream gauging station - unit hydrograph-S-curve hydrograph –unit hydrograph of different deviations - synthetic unit hydrograph - methods for peak discharge estimation - frequency analysis of stream flow data.

UNIT IV	RESERVOIR MANAGEMENT	9

Single purpose and multipurpose reservoir - determination of storage capacity and yield – strategies for reservoir operation - reservoir reliability - methods of flood control - flood forecasting.

UNIT V	GROUNDWATER HYDROLOGY	9

Types of geologic formations and aquifers - aquifer properties - Darcy's law - transmissibility – well hydraulics - steady state flow equations for confined and unconfined aquifers - cavity wells - yield of a well - construction of open wells and bore wells.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Written Test	MCQ	Written Test

Outcomes

Upon completion of the course, the students will be able to:

CO603-1.1 Infer the fundamentals of hydrological parameters and need for water conservation.
CO603-1.2 Assess the variations in distribution of rainfall, runoff, infiltration and evapo transpiration.
CO603-1.3 Demonstrate development and applications of hydrographs and frequency analysis from stream flow data.
CO603-1.4 Attribute strategies for sustainable reservoir operation and flood control using reliability economic analysis and flood routing techniques.
CO603-1.5 Identify methods of groundwater assessment and extraction including factors affecting groundwater yield.

Text Books

1. Raghunath .H.M, "Hydrology", New Age International Publishers, New Delhi, 2007.
2. Santhosh Kumar Garg, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, 2000.
3. Asawa .G.L, "Irrigation and Water Resources Engineering", New Age International Publishers, New Delhi, 2005.
4. Sharma .R.K, "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Company, New Delhi, 2002.

Reference Books

1. Raghunath .H.M, *"Ground Water Hydrology"*, Wiley Eastern Ltd., Second reprint, 2000.
2. VenTeChow, D.R. Maidment and L.W. Mays, Applied Hydrology, 1st Edition, McGraw Hill,NewYork,ISBN: 0071001743,1998.
3. K.N. Duggal, J.P. Soni, Elements of Water Resources Engineering, New Age International Pvt Ltd Publishers, New Delhi, ISBN: 8122408079, 2008.
4. P. Jaya Rami Reddy, A Textbook of Hydrology,3rd Edition, Tata McGraw Hill, New Delhi,2016, ISBN:9380856040, 2016.

Web Recourses

1. http://nptel.ac.in/courses/105104103/
2. http://nptel.ac.in/courses/105105110/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1				1	1					1		1
2	2	1	1			1	2					1	1	1
3	1	2	2									1	2	1
4	2	2				1	1					2	1	1
5	2	2	1			1	1					2	2	1

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	40	40	40	40	40
Apply	40	40	40	40	40
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. i) Write short notes on Water Resources Survey.
   ii) What are the different types of Meteorological and Hydrological Data?

2. i) Write down the order of water allocation priorities in National Water policy.
   ii) List out any 4 important river basins in India.

COURSE OUTCOME 2:

1. Explain various types of precipitation.

2. Briefly discuss about different methods to find the mean rainfall in catchment area.

COURSE OUTCOME 3:

1. Define Instantaneous unit hydrograph. How does it differ from unit hydrograph of finite duration?
2. i) Describe double mass curve method to check the consistency of rainfall data.
   ii) The annual rainfalls in cm at a station for a period of 21 years from 1960 to 1980 are 97, 125, 103, 81, 101, 119, 103, 79, 102, 118, 98, 83, 105, 123, 100, 86, 99, 114, 91, 83 and 106. Determine the 75% dependable rainfall from frequency analysis.

COURSE OUTCOME 4:

1. Explain how the storage capacity of reservoir is fixed?
2. Discuss the classification of earth dams with neat sketches bringing out their relative merits and demerits.

COURSE OUTCOME 5:

1. During the recuperation test conducted on an open well in a region, the water level in the well was depressed by 3 m and it was observed to rise by 1.75 m in 75 minutes. What is the specific yield from wells in that region? What could be the yield from a well of 5 m diameter under a depression head of 2.5 m? What should be the diameter of the well to give a yield of 12 lit/s under a depression head of 2 m? Explain the noise control methodologies.
2. Explain the terms (i) cone of depression (ii) specific yield (iii) flowing well (iv) Darcy's velocity.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - INTRODUCTION		
1	Climate and weather- meteorological and hydrological parameters -	2
2	water-budget equation	1
3	water resources survey - consumptive and non-consumptive water use	2
4	water scarcity and its impacts	2
5	Water resources planning - national water policy.	2
UNIT II FUNDAMENTALS OF HYDROLOGY		
1	Rain Water Harvesting: Introduction	1
2	Rain Water Harvesting, Roof Water Harvesting, Water Harvesting by Ponds, Water Quality Consideration.	2
3	Roof Water Harvesting	2
4	Water Harvesting by Ponds	2
5	Water Quality Consideration.	2
UNIT III ANALYSIS OF STREAM FLOW		

1	Components of stream flow - stream gauging	1
2	selection of site for stream gauging station	1
3	unit hydrograph-S-curve hydrograph	2
4	unit hydrograph of different deviations - synthetic unit hydrograph	2
5	methods for peak discharge estimation	1
6	Frequency analysis of stream flow data.	2
UNIT IV RESERVOIR MANAGEMENT		
1	Single purpose and multipurpose reservoir	1
2	determination of storage capacity and yield	2
3	strategies for reservoir operation - reservoir reliability -	2
4	methods of flood control	2
5	Flood forecasting.	2
UNIT V GROUNDWATER HYDROLOGY		
1	Types of geologic formations and aquifers	1
2	aquifer properties - Darcy's law - transmissibility	3
3	well hydraulics - steady state flow equations for confined and unconfined aquifers	3
4	cavity wells - yield of a well	2
5	construction of open wells and bore wells	

21CE6804	**WASTE MANAGEMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisites for the course

- Environmental Science

Objectives

1. To understand of the basic principles of waste and resource management will be supplemented, where appropriate, by practical problem-solving exercises.
2. To provide detailed knowledge and skills in the management, treatment, disposal and recycling options for solid wastes.
3. To provide details on resource efficiency plays in conserving resources and contributing to a low carbon economy.

UNIT I	INTRODUCTION & TYPES OF SOURCES	9

Problems and need of solid and hazardous waste management - Waste management planning - Toxicology and risk assessment - Legislations on management and handling of different types of wastes.

UNIT II	WASTE GENERATION RATES	9

Composition - Hazardous Characteristics – TCLP tests – waste sampling- reduction of wastes at source – Recycling and reuse. Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations -labeling and handling of hazardous wastes.

UNIT III	WASTE PROCESSING	9

Processing technologies – biological and chemical conversion technologies – Composting - thermal conversion technologies - energy recovery – incineration – solidification and stabilization of hazardous wastes - treatment of biomedical wastes.

UNIT IV	DISPOSAL	9

Site selection - design and operation of sanitary landfills - secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – landfill remediation – Smart disposal techniques.

UNIT V	ECONOMY AND FINANCIAL ASPECTS	9

Elements of integrated waste management - Economy and financial aspects of waste management. Other Waste Types: Nuclear and Radio Active Wastes.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Understand and apply the basic for solving practical waste management challenges

CO2: Understand the collection of waste and recycling

CO3: Understand the fundamental principles of technologies for the treatment of waste.
CO4: Appreciate the role of decision-making tools in critical assessment of major waste issues.
CO5: Understand the economy and financial aspects of waste management

Text Books

1. Hilary Theisen and Samuel A, Vigil, George Tchobanoglous, Integrated Solid Waste Management, McGraw- Hill, New York, 1993.

Reference Books

1. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000
2. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York, 2001.
3. Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc., Singapore, 2002.
4. Charles A. Wentz, Hazardous Waste Management, Second Edition, Pub: McGraw Hill International Edition, New York, 1995

Web Resources

1. https://nptel.ac.in/courses/120108005

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		3	3		3		3							2
2			3		3		3							2
3				3	3							2		2
4		3	3				2							2
5			3		1				2		3	3		2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember					
Understand	50	50	50	50	50
Apply	50	50	50	50	50
Analyze					
Evaluate					

Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

3. Explain about the waste management planning in detail.
4. Write about the salient features of Solid waste management rules,2016.

COURSE OUTCOME 2:

1. Define Transfer station, Explain the role and usefulness of transfer station. Also explain selection of site for Transfer Station.
2. What can you do to reduce solid waste? With a neat diagram explain the resource recovery facility producing various marketable products from municipal solid waste.

COURSE OUTCOME 3:

3. Write about biological conversion technology in waste management.
4. What are solidification and stabilization of waste? How dothese processes work?

COURSE OUTCOME 4:

1. What are the criteria for site selection for land fill.
2. What is smart waste management technique? Write about the various techniques.

COURSE OUTCOME 5:

3. Explain in detail about the elements of integrated solid waste management.
4. Write about the financial aspects of waste management.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - I INTRODUCTION AND TYPES OF SOURCES		
1	Introduction and types of sources	1
2	Problems and need of solid and hazardous waste management	1
3	Types of sources	2
4	Waste management planning	1

5	Toxicology and risk assessment	2
6	Legislations on management and handling of different types of wastes	2
Unit II WASTE GENERATION RATES		
1	Composition of solid waste	1
2	Hazardous Characteristics	1
3	TCLP tests for hazardous waste	1
4	waste sampling and reduction of wastes at source	1
5	Recycling and reuse	1
6	Handling and segregation of wastes at source – storage	1
7	collection of municipal solid wastes, analysis of Collection systems	1
8	Need for transfer and transport, transfer stations	1
9	Labeling and handling of hazardous wastes	1
Unit III WASTE PROCESSING		
1	Processing technologies	1
2	Biological conversion technologies	1
3	Chemical conversion technologies	1
4	Composting	1
5	Thermal conversion technologies	1
6	Energy recovery	1
7	Incineration	1

8	Solidification and stabilization of hazardous wastes	1
9	Treatment of biomedical wastes.	1
Unit IV DISPOSAL		
1	Site selection	1
2	design and operation of sanitary landfills	1
3	secure landfills	1
4	landfill bioreactors	2
5	leachate and landfill gas management	1
6	landfill closurea and landfill closure	1
7	landfill remediation	1
8	Smart disposal techniques	1
Unit V ECONOMY AND FINANCIAL ASPECTS		
1	Elements of integrated waste management	2
2	Economy and financial aspects of waste management	2
3	Waste Types	1
4	Nuclear Wastes	2
5	Radio Active Wastes	2

21CE6805	**SUSTAINABLE CONSTRUCTION METHODS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisites for the course

- Environmental Sciences
- Basics of Energy Resources

Objectives

1. To sensitize about the various aspects of sustainable and green building design.

2. To study and understand the properties of building materials used in sustainable construction.

3. To provide an insight into various Energy Efficient Materials and Sustainable Construction Technology.

UNIT I	INTRODUCTION	9

General premises and strategies for sustainable and green design – Global environmental crisis - Ozone depletion - Resource extraction - Transport congestion - Sprawl- Water pollution - Toxic pollution - Waste accumulation – Key role of construction sector in ensuring sustainability

UNIT II	ENVIRONMENTAL IMPACT OF BUILDING MATERIALS	9

Impact measurement of building materials - Embodied energy calculation - Recycling and Embodied energy - Processing and Embodied energy - Time and Embodied energy - Embodied energy of different building materials - Low energy building and Masonry materials - Life cycle and Analysis - Case studies and analysis.

UNIT III	SUSTAINABLE BUILDING – PRACTICE THEORY	9

Sustainable building systems and environmental impacts - 5Es of sustainability - Scales and program diversity of buildings – Stages of environmental assessment and intervention - Whole life costing and Life cycle analysis – Carbon footprint – Integrated design approach –– Sustainable materials, old and new - Cultural context, holistic building traditions and invention - Cradle to Cradle – Biomimicry – Resource abundance by design - Recycling and reuse

UNIT IV	RECYCLABLE AND RENEWABLE MATERIALS	9

Concept of Recyclable materials – Sustainable Building Materials – Life Cycle Design of Materials –Biodegradable & Non-Biodegradable Materials – Green rating and Building Materials –– Concept of Resource reuse, Recycled content, Regional materials, Rapidly renewable materials – Fly ash bricks, Cement – Recycled Steel, Bamboo based products

UNIT V	GREEN BUILDING MATERIALS AND TECHNOLOGY	9

Green building product and materials - Product selection criteria: concrete, eco block, insulated concrete forms(ISF), hydra form, prefabs / structural insulating panels, cellulose insulation, adobe, rammed earth, earth sheltered and recycled materials - Biomaterials : Properties, application, specification and standards(Indian and International) - Bio materials from industrial waste, mining waste, mineral waste, agricultural waste.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO601.1 Gain knowledge on general sustainable design and the role of the construction sector.
CO601.2 Insight on environmental impact of building materials.
CO601.3 Implement various sustainable building design practices.
CO601.4 Build idea on recyclable and renewable materials.
CO601.5 Get ideas on various technologies for sustainable construction of buildings.

Text Books

1. Daniel Vallero and Chris Brasier: Sustainable Design - The science of sustainability and Green Engineering; Wiley, 2008.

2. Watson Donald, ‗Climatic Design: Energy Efficient Building Principles & Practices‖, McGraw Hill Book company, New York, 1993.

Reference Books

1. Paul Appleby, Integrated Sustainable Design of Buildings, Earthscan, 2010.

2. Brenda and Robert Vale: Green Architecture, Design for a Sustainable Future; Thames and Hudson,

1996.

3. Tillman Lyle, J. Regenerative Design for Sustainable Development, John Wiley and Sons, 1966.

Web Resources

1. https://nptel.ac.in/courses/105/102/105102195/

2. https://nptel.ac.in/courses/105/105/105105157/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	-	-	-	-	1	3	-	-	-	2	1	-	3

2	3	-	-	-	-	1	3	-	-	-	2	1	-	3
3	3	-	-	-	-	1	3	-	-	-	2	1	-	3
4	3	-	-	-	-	1	3	-	-	-	2	1	-	3
5	3	-	-	-	-	1	3	-	-	-	2	1	-	3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	**CAT 1**	**CAT 2**	**FAT 1**	**FAT 2**	**END SEM EXAM**
Remember	10	10	10	10	10
Understand	10	10	10	10	10
Apply					
Analyze	80	80	80	80	80
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Explain in details about the General premises and strategies for sustainable and green design

2. Describe various Key role of construction sector in ensuring sustainability

COURSE OUTCOME 2:

1. Write short notes on
(i) Impact measurement of building materials
(ii) Recycling and Embodied energy

2. Case studies and analysis of Environmental impact of building materials

COURSE OUTCOME 3:

1. Describe the Stages of environmental assessment and intervention
2. Explain in details about the Whole life costing and Life cycle analysis, Carbon footprint & Integrated design approach

COURSE OUTCOME 4:

1. Explain in details about the Concept of Recyclable materials & Sustainable Building Materials
2. Write Short notes on

(i)Fly ash bricks,
(ii) Cement
(iii) Recycled Steel
(iv) Bamboo based products

COURSE OUTCOME 5:

1. Explain in detail about the Green building product and materials and Product selection criteria:.
2. Describe the Bio materials from industrial waste, mining waste, mineral waste, agricultural waste.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
	UNIT I INTRODUCTION	
1	General premises and strategies for sustainable and green design	1
2	Global environmental crisis	1
3	Ozone depletion	1
4	Resource extraction	1

5	Transport congestion	1
6	Sprawl- Water pollution	1
7	Toxic pollution - Waste accumulation	2
8	Key role of construction sector in ensuring sustainability	1
UNIT II ENVIRONMENTAL IMPACT OF BUILDING MATERIALS		
1	Impact measurement of building materials	1
2	Embodied energy calculation	1
3	Recycling and Embodied energy	1
4	Processing and Embodied energy	1
5	Time and Embodied energy	1
6	Embodied energy of different building materials	1
7	Low energy building and Masonry materials	1
8	Life cycle and Analysis - Case studies and analysis.	2
UNIT III SUSTAINABLE BUILDING – PRACTICE THEORY		
1	Sustainable building systems and environmental impacts	1
2	5Es of sustainability - Scales and program diversity of buildings	1
3	Stages of environmental assessment and intervention	1
4	Whole life costing and Life cycle analysis	1
5	Carbon footprint – Integrated design approach	1

6	Sustainable materials, old and new -	1
7	Cultural context, holistic building traditions and invention -	1
8	Cradle to Cradle – Biomimicry – Resource abundance by design - Recycling and reuse	2
UNIT IV RECYCLABLE AND RENEWABLE MATERIALS		
1	Concept of Recyclable materials	1
2	Sustainable Building Materials	1
3	Life Cycle Design of Materials	1
4	Biodegradable & Non-Biodegradable Materials	1
5	Green rating and Building Materials	1
6	Concept of Resource reuse, Recycled content, Regional materials, Rapidly renewable materials	2
7	Fly ash bricks, Cement	1
8	Recycled Steel, Bamboo based products	1
UNIT V GREEN BUILDING MATERIALS AND TECHNOLOGY		
1	Green building product and materials	1
2	Product selection criteria: concrete, eco block, insulated concrete forms(ISF)	2
3	Hydra form, prefabs / structural insulating panels, cellulose insulation	1
4	Adobe, rammed earth, earth sheltered and recycled materials	1
5	Bio materials : Properties, application, specification and standards(Indian and International)	2

6	Bio materials from industrial waste	1
7	Mining waste, Mineral waste, Agricultural waste.	1

Open Elective III

S.No	Course Code	Course Name	Semester	L	T	P	C	Offered by
1	21CE7701	Building Planning and Construction	7	3	0	0	3	CIVIL

2	21CE7702	Environmental and Social Impact Assessment	7	3	0	0	3	CIVIL
3	21CE7703	Energy Conservation in Building	7	3	0	0	3	CIVIL
4	21CE7804	Waste Water Treatment	7	3	0	0	3	CIVIL
5	21CE7805	Green Building design	7	3	0	0	3	CIVIL

21CE7701	**BUILDING PLANNING AND CONSTRUCTION**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisites for the course

Nil

Objectives

1. To create the building plan for creating human comfort in the buildings.
2. The main objective of this course is to make the student aware of the various construction techniques and practices for different types of construction activities.

UNIT I	**BUILDING PLANNING**	**9**

History of Building, Elements of a Building, Basic Requirements of a Building, Planning, Planning Suitable Orientation, Planning for Energy Efficiency, Planning for Suitable Utility, Planning for Meeting Other Requirements.

UNIT II	**BUILDING TYPES**	**9**

Types of Buildings Based on Occupancy - Residential Buildings, Educational Buildings, Institutional Buildings, Assembly Buildings, Business Buildings, Mercantile Buildings, Industrial Buildings, Storage Buildings, Hazardous Buildings. Other Guidelines for Classification

Types of Residential Buildings - Detached House, Semi-Detached House, Row Houses or Chawls, Duplex Type Houses, Apartments. Classification as per National Building Code of India.

UNIT III	**SITE SELECTION FOR RESIDENTIAL BUILDINGS**	**9**

Topography of Site, Shape of Site, Nature of Subsoil, Position of Groundwater Table, Facilities, Neighbourhood, Certain Things to be Avoided Near the Site, Vegetation, Availability of Men and Material, Proximity to Seashore, Conclusion.

UNIT IV	**METHODS OF CONSTRUCTION**	**9**

Load Bearing Structure, Framed Structures, Comparison of Load Bearing Structures with Framed Structures, Cast in situ Construction, Prefabricated Construction.

UNIT V	**CONSTRUCTION PRACTICES**	**9**

Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork – Formwork – scaffoldings – de-shuttering forms – Concreting – Masonry Work – weather and water proof – roof finishes – acoustic and fire protection.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes
Upon completion of the course, the students will be able to:
CO1: Create a suitable building plan to satisfy the sustainable needs. **CO2:**Identify the types of building for fundamental and mandatory needs. **CO3**: Distinguish an appropriate location for constructing a residential building. **CO4:**Identify suitable and economical construction methodology for execution. **CO5:**Deploy the various construction practices on masonry construction and framed structure.
Text Books
1.S.S Bhavikatti & M.V. Chitawadagi., —Building Planning and Drawing, I.K International Pvt. Ltd., New Delhi, 2014. 2.S.S Bhavikatti., —Basic Civil Engineering, New Age International Publishers., New Delhi, 2014.
Reference Books
1. National Building Code Part 1, 4, 8, 9‖, Bureau of Indian Standards, New Delhi.
Web Recourses **4.** https://archive.nptel.ac.in/courses/105/102/105102088/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	1	3	-	2	-	-	-	1	-	1		3
2	1	-	1	2	1	1	-	1	1	-	-	1		3
3	1	-	-	3	2	1	1	-	-	-	-	1		3
4	1	-	-	2	1	-	1	1	-	-	-			3
5	1	-	-	2	1	-	2	1	-	-	-	1		3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	25	25	25	25	50
Understand	25	25	25	25	50
Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. List the structural elements of building and its features.
2. How a building can be converted into energy efficient structure. Explain with an example.

COURSE OUTCOME 2:

1. Explain the Different Types of Buildings Based on Occupancy
2. With suitable example justify when Semi-Detached House is preferred by residents.

COURSE OUTCOME 3:

1. How Position of Groundwater Table affects the location of building Explainwith justification.
2. What are the things to be avoided at the proximity of Site?

COURSE OUTCOME 4:

1. Explain the load transfer mechanism for framed structure.
2. Differentiate Load bearing structure and framed structure.

COURSE OUTCOME 5:

1. What is formwork, why it's important in construction and explains its significance?
2. Explain the relevant method of acoustic treatment for the theatre building structure.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - BUILDING PLANNING		
1	History of Building	1
2	Elements of a Building	1
3	Basic Requirements of a Building	2
4	Planning	1
5	Planning Suitable Orientation	1
6	Planning for Energy Efficiency	1
7	Planning for Suitable Utility	1
8	Planning for Meeting Other Requirements.	1
Unit II BUILDING TYPES		
1	Types of Buildings Based on Occupancy - Residential Buildings, Educational Buildings, Institutional Buildings,	2

2	Assembly Buildings, Business Buildings, Mercantile Buildings,	2
3	Industrial Buildings, Storage Buildings, Hazardous Buildings.	1
4	Other Guidelines for Classification	1
5	Types of Residential Buildings - Detached House, Semi-Detached House.	1
6	Row Houses or Chawls, Duplex Type Houses, Apartments.	1
7	Classification as per National Building Code of India.	1
Unit III SITE SELECTION FOR RESIDENTIAL BUILDINGS		
1	Topography of Site, Shape of Site.	1
2	Nature of Subsoil.	1
3	Position of Groundwater Table.	1
4	Facilities and Neighbourhood	2
5	Certain Things to be Avoided Near the Site and Vegetation,	2
6	Availability of Men and Material and Proximity to Seashore.	2
Unit IV METHODS OF CONSTRUCTION		
1	Load Bearing Structure	2
2	Framed Structures	2
3	Load transfer mechanism	2
4	Comparison of Load Bearing Structures with Framed Structures	1
5	Cast in situ Construction	1
6	Prefabricated Construction.	1

Unit V CONSTRUCTION PRACTICES.		
1	Specifications, details and sequence of activities.	2
2	construction co-ordination, Site Clearance	1
3	Marking, Earthwork, Formwork.	1
4	Scaffoldings, de-shuttering forms,.	1
5	Concreting, Masonry Work	1
6	weather and water proof	1
7	Roof finishes	1
8	Acoustic and fire protection	1

21CE7804	**WASTEWATER TREATMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisites for the course		
• Environmental Sciences • Water supply Engineering		
Objectives		
1. The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena. 2. To gain knowledge for successful design, operation and maintenance of sewage treatment plants.		
UNIT I	**PLANNING 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– sewage pumping-drainage in buildings-plumbing systems for drainage.		
UNIT II	**PRIMARY TREATMENT OF WASTE WATER**	**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 WASTE WATER**	**9**
Objectives – Selection of Treatment Methods – Principles, Functions –Activated Sludge Process and Trickling filter (no design); Other treatment methods - oxidation ditches, UASB - Waste Stabilization Ponds - Anaerobic Stabilization units (no design); Reclamation and Reuse of sewage, Advances in sewage treatment - Construction, Operation and Maintenance aspects.		
UNIT IV	**DISPOSAL OF SEWAGE**	**9**
Standards for disposal – Methods – dilution – self-purification of river- Oxygen sag curve – deoxygenation and reaeration – Streeter–Phelps model – Land disposal.		
UNIT V	**SLUDGE TREATMENT AND DISPOSAL**	**9**
Objectives – Sludge characterization – Thickening - Sludge digestion –Biogas recovery – Sludge Conditioning and Dewatering – Sludge drying beds- ultimate residue disposal – recent advances.		
	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
Written Test	MCQ	Written Test

Outcomes
Upon completion of the course, the students will be able to:
CO 1 An ability to estimate sewage generation and design sewer system including sewage pumping stations CO 2 The required understanding on the characteristics and composition of sewage, self-purification of streams CO 3 An ability to perform basic design of the unit operations and processes that are used in sewage treatment

CO 4 Understand the standard methods for disposal of sewage. CO 5 Gain knowledge on sludge treatment and disposal.
Text Books
1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers,New Delhi, 2015. 2. Punmia, B.C., Jain, A.K., and Jain.A.K.., Environmental Engineering, Vol.II, Laxmi Publications, 2010 .
Reference Books
1. Duggal K.N., ― Elements of Environmental Engineering‖ S. Chand and Co. Ltd., New Delhi, 2014 .
Web Recourses 1. https://nptel.ac.in/courses/105/105/105105178/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3				3							
2							3					3		3
3	3	3	3				3					3		2
4	3			3			3							1
5		2		2			3					3		2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	30	30	30	30	30
Apply	20	20	20	20	20
Analyze	40	40	40	40	40
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. List out the characteristics and composition of sewage and state their environmental significance.

2. BOD of a sewage incubated for 2 days at 300C was found to be 160 mg/L. Find the value of 5 day 200C BOD. Assume k(base 10) at 200□C as 0.12 per day.

COURSE OUTCOME 2:

1. Two primary settling basins are 25 m in diameter with 2.5 m side water depth. Single effluent weirs are located on the peripheries of the tanks. For a water flow of 30000 m^3/day, calculate i) surface area and volume ii) overflow rate in m^3/m^2/d iii) detention time in hours and iv) weir loading in m^3/m/day (Analyze)

2. Design a grit chamber for a maximum wastewater flow of 10000 m^3/day to remove particles up to of 0.25 mm diameter, having specific gravity of 2.65. The settling velocities of these particles are found to range from 0.02 to 0.025 m/sec. Maintain a constant flow through velocity of 0.28 m/sec through the provision of a proportional flow weir.(Analyze)

COURSE OUTCOME 3:

1. Define activated sludge process with their operation including advantages and disadvantages. (Understand)
2. Illustrate about waste stabilization ponds? Explain the working principle of aerobic stabilization pond. (Understand)

COURSE OUTCOME 4:

1. Draw a typical oxygen sag curve and explain its meaning and state its importance. (Understand)
2. What is sewage farming? What are its advantages over the method of disposal of sewage by dilution? (Understand)

COURSE OUTCOME 5:

1. With neat sketch explain the disposal of sludge in sludge drying beds. (Understand)
2. Discuss briefly about the sludge digestion tank with a neat sketch. (Understand)

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - PLANNING OF SEWERAGE SYSTEM		
1	Characteristics and composition of sewage – population equivalent	1

2	Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers	2
3	Sewer design – Storm drainage-Storm runoff estimation	2
4	sewer appurtenances – corrosion in sewers – prevention and control	2
5	sewage pumping-drainage in buildings-plumbing systems for drainage.	2
Unit II PRIMARY TREATMENT OF WASTE WATER		
1	Objectives – Unit Operations and Processes – Selection of treatment processes	2
2	Onsite sanitation – Septic tank- Grey water harvesting	2
3	Primary treatment – Principles, functions and design of sewage treatment units – screens – grit chamber	2
4	primary sedimentation tanks – Construction, Operation	1
5	primary sedimentation tanks – Construction, Operation and Maintenance aspects.	2
Unit III SECONDARY TREATMENT OF WASTE WATER		
1	Objectives – Selection of Treatment Methods – Principles, Functions, – Activated Sludge Process and Extended aeration systems.	2
2	Trickling filters– Sequencing Batch Reactor(SBR) – Membrane Bioreactor.	2
3	UASB – Waste Stabilization Ponds – – Other treatment methods -Reclamation and Reuse of sewage.	2
4	Recent Advances in Sewage Treatment – Construction, Operation and Maintenance aspects.	3
Unit IV DISPOSAL OF WASTE WATER		
1	Standards for– Disposal – Methods	2
2	dilution –Self-purification of river	2
3	Oxygen sag curve – deoxygenation and reaeration	3

4	Streeter–Phelps model – Land disposal.	2
Unit V CASE STUDIES		
1	Objectives – Sludge characterization	2
2	Thickening - Sludge digestion	2
3	Biogas recovery Biogas recovery – Sludge Conditioning and Dewatering – Sludge drying beds.	3
4	Ultimate residue disposal – recent advances.	2

21CE7805	GREEN BUILDING DESIGN	L	T	P	C
		3	0	0	3

Prerequisites for the course

Nil

Objectives

1. To investigate the environmental implications caused by buildings and its construction practices.
2. To identify the convenient and comfortable living space for personnel.
3. To enhance the renewable energy use and water management in the building systems.

UNIT I	ENVIRONMENTAL IMPLICATIONS OF BUILDINGS	9

Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings.

UNIT II	IMPLICATIONS OF BUILDING TECHNOLOGIES	9

Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

UNIT III	COMFORTS IN BUILDING	9

Thermal Comfort in Buildings- Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings-Implications of Geographical Locations.

UNIT IV	UTILITY OF SOLAR ENERGY IN BUILDINGS	9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT V	GREEN COMPOSITES FOR BUILDINGS	9

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Investigate the environmental implications caused by building materials.

CO2: Estimate building technologies that embodied energy of buildings.

CO3: Analyze the comfortable living space with respect to material and construction.

CO4: Deploy the possibility of using solar energy infused in buildings.

CO5: Employ the green composite concept and waste management in building.

Text Books

1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
2. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
3. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

Reference Books

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke

Web Recourses

1. https://archive.nptel.ac.in/courses/105/102/105102195/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	1	3	-	2	-	-	-	-	-	1		3
2	1	-	1	3	-	1	-	1	-	-	-	1		3
3	1	-	-	1	1	3	1	-	-	-	-	1		3
4	1	-	-	2	1	-	2	1	-	-	-	1		3
5	1	-	-	2	1	-	3	1	-	-	-	1		3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	25	25	25	25	50
Understand	25	25	25	25	50
Apply					
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. What are the environmental impacts of building?
2. Explain the phases of LCA and state its advantages and disadvantages

COURSE OUTCOME 2:

1. Define embodied energy and write the guidelines for reducing it.
2. Write the application of biomass fiber in construction area.

COURSE OUTCOME 3:

1. Explain the Measurement Methods of comfort in existing Buildings.
2. What are the acceptable thermal conditions in occupant-controlled naturally conditioned spaces?

COURSE OUTCOME 4:

1. Explain the building window orientation design for variousclimatic conditions
2. Illustrate how all three forms of solar energy are in Harmony

COURSE OUTCOME 5:

1. Quote the practices, challenges and solutions of urban waterdevelopment m developing countries.
2. Explain some simple grey water management systems.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - ENVIRONMENTAL IMPLICATIONS OF BUILDINGS		
1	Energy use, carbon emissions, water use, waste disposal.	1
2	Building materials: sources	1
3	Building materials methods of production and environmental Implications.	2
4	Embodied Energy in Building Materials:	2
5	Transportation Energy for Building Materials.	1
6	Transportation Energy for Masonry Construction.	1
7	Masonry Construction	1
Unit II IMPLICATIONS OF BUILDING TECHNOLOGIES		
1	Framed Construction.	2
2	Masonry Construction.	2

3	Resources for Building Materials.	1
4	Alternative concepts.	1
5	Recycling of Industrial Wastes	1
6	Recycling of Buildings Wastes	1
7	Biomass Resources for buildings	1
Unit III COMFORTS IN BUILDING		
1	Thermal Comfort in Buildings and Issues.	2
2	Heat Transfer.	1
3	Characteristic of Building Materials.	2
4	Characteristic of Building Techniques.	2
5	Incidence of Solar Heat on Buildings	1
6	Implications of Geographical Locations.	1
Unit IV UTILITY OF SOLAR ENERGY IN BUILDINGS		
1	Utility of Solar energy in buildings.	2
2	Concepts of Solar Passive Cooling.	2
3	Heating of Buildings.	2
4	Low Energy Cooling.	1
5	Case studies of Solar Passive Cooled.	1
6	Case studies of Solar Heated Buildings.	1
Unit V GREEN COMPOSITES FOR BUILDINGS		
1	Concepts of Green Composites.	1
2	Water Utilisation in Buildings.	1

3	Low Energy Approaches to Water Management.	1
4	Management of Solid Wastes.	1
5	Management of Sullage Water and Sewage.	2
6	Urban Environment and Green Buildings.	1
7	Green Cover and Built Environment.	2

Open Elective IV

S.No	Course Code	Course Name	Semester	L	T	P	C	Offered by
1	21CE7806	Intelligent Transportation Systems	8	3	0	0	3	CIVIL
2	21CE7807	Concept of Architectural design	8	3	0	0	3	CIVIL
3	21CE7808	Air Pollution and Control Engineering	8	3	0	0	3	CIVIL
4	21CE7809	Testing of Materials	8	3	0	0	3	CIVIL
5	21CE7810	Disaster management	8	3	0	0	3	CIVIL

21CE7807	CONCEPT OF ARCHITECTURAL DESIGN	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Architecture and town planning

Objectives

1. To acquire knowledge on the basics of Architectural design - introduction to basic elements, principles of design, integration of function and aesthetics.
2. To understand the concepts site planning, conduct site surveys, site analysis, layout regulations and layout design.
3. To differentiate various building forms, apply anthropometry and space standards, to know building rules and regulations and its integration into building design.
4. To understand the climate so as to evolve an environmental responsive design of buildings.
5. To know town planning, its concepts & processes, standards, zoning regulations, urban design and principles of landscape design.

UNIT I	ARCHITECTURAL DESIGN I	9

Introduction - Architectural Design – an analysis – integration of function and aesthetics – I troduction to basic elements and principles of design.

UNIT II	SITE PLANNING	9

Surveys – Site analysis – Development Control – Layout regulations- Layout design concepts.

UNIT III	BUILDING TYPES	9

Residential, institutional, commercial and Industrial – Application of anthropometry and space standards Inter relationships of functions – Safety standards – Building rules and regulations – Integration of building services – Interior design.

UNIT IV	CLIMATE AND ENVIRONMENTAL RESPONSIVE DESIGN	9

Man and environment interaction- Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls – Green building concept.

UNIT V	TOWN PLANNING	9

Planning – Definition, concepts and processes- Urban planning standards and zoning regulations- Master plan, Remote Sensing and GIS in town planning - Urban renewal – Conservation – Principles of Landscape design.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO 1 Get familiarised with the basics of Architectural design - introduction to basic elements, Principles of design, integration of function and aesthetics.

CO 2 Use the basics of site planning, conduct site surveys, site analysis, to know layout regulations and layout design.

CO 3 To differentiate various building forms, apply anthropometry and space standards, to know building rules and regulations and its integration into building design.

CO 4 Get familiarized with the climate so as to evolve an environmental responsive design of buildings.

CO 5 Study about the concepts of town planning.

Text Books

1. Pramar. V.S. —Design fundamental in Architecture||, Somaiya Publications Pvt. Ltd., New Delhi, 1997

2. Muthu Shoba Mohan.G.,||Principles of Architecture||., Oxford University Press., New Delhi, 2006.

3. Rangwala. S.C. —Town Planning|| Charotar Publishing House., Anand, 2005.

Reference Books

1. De Chiara.J., Michael. J. Crosbie.,||Time Saver Standards for Building Types||, McGraw Hill Publishing Company, New York, 2001.

2. Arvind Krishnan, Nick Baker, Simos Yannas, Szokolay.S.V., —Climate Responsive Architecture||.,

3. A Design Hand Book for Energy Efficient Building, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2007.

4. National Building Code of India., SP7 (Group 1) Bureau of Indian Standards, New Delhi, 2005..

Web Resources

https://nptel.ac.in/courses/124/107/124107005/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	-	3	-	-	-	1	-	-	-	-	1		3
2	3	-	3	-	-	-	1	-	-	-	-	1		3
3	3	-	3	-	-	-	1	-	-	-	-	1		3
4	3	3	3	-	-	-	1	-	-	-	-	1		3
5	3	3	3	-	-	-	1	-	-	-	-	1		3

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	10	10	10	10	10
Understand	30	30	30	30	30
Apply					
Analyze	60	60	60	60	60

Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Briefly describe the Architectural Design
2. Discuss the creative principles of design

COURSE OUTCOME 2:

1. Explain different types of surveys to be conducted for a site planning in architectural design.
2. Explain the following terms
   (i)Layout regulations
   (ii) Layout design concepts

COURSE OUTCOME 3:

1. Explain different types of buildings in architectural design
2. Briefly describe the importance of building rules and regulation..

.

COURSE OUTCOME 4:

1. What are the factors affecting architectural development?
2. Discuss the Passive and active energy controls

COURSE OUTCOME 5:

1. Describe the Concept of preparing a master plan for large scale.
2. Explain the Applications of Remote Sensing and GIS in town planning

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I ARCHITECTURAL DESIGN I		
1	Introduction	1

2	Architectural Design	2
3	An analysis	2
4	Integration of function and aesthetics	2
5	Introduction to basic elements and principles of design.	2
UNIT II SITE PLANNING		
1	Introduction	1
2	Surveys	1
3	Site analysis	2
4	Development Control	2
5	Layout regulations	2
6	Layout design concepts	1
UNIT III BUILDING TYPES		
1	Residential and Institutional	1
2	Commercial and Industrial	1
3	Application of anthropometry and	2
4	Space standards Inter relationships of functions	1
5	Safety standards	1
6	Building rules and regulations	1
7	Integration of building services	1

8	Interior design.	1
UNIT IV CLIMATE AND ENVIRONMENTAL RESPONSIVE DESIGN		
1	Man and environment interaction	1
2	Factors that determine climate	2
3	Characteristics of climate types	1
4	Design for various climate types	1
5	Passive and active energy controls	2
6	Green building concept.	2
UNIT V TOWN PLANNING		
1	Planning	1
2	Definition, concepts and processes	1
3	Urban planning standards and zoning regulations	2
4	Master plan,	1
5	Remote Sensing and GIS in town planning	1
6	Urban renewal	1
7	Conservation	1
8	Principles of Landscape design.	1

21CE7808	AIR POLLUTION AND CONTROL ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Environmental sciences

Objectives

3. To provide general understanding of quality of air and impact on local and global effects of air pollution on human, materials, properties and vegetation
4. To discuss the various types of air pollution control equipment and their design principles and limitation.
5. To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

UNIT I	INTRODUCTION	9

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.

UNIT II	METEOROLOGY	9

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III	CONTROL OF PARTICULATE CONTAMINANTS	9

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle - Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators.

UNIT IV	CONTROL OF GASEOUS CONTAMINANTS	9

Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring.

UNIT V	INDOOR AIR QUALITY MANAGEMENT	9

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

Total Periods	45

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	Formative Assessment Test (10 Marks)	End Semester Exams (60 Marks)
Written Test	MCQ	Written Test

Outcomes

Upon completion of the course, the students will be able to:

CO 1 Understand the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
CO 2 Apply and relate the significance of various air pollution dispersion models.
CO 3 Ability to select control equipments for particulate contaminants.
CO 4 Ability to select control equipments for gaseous contaminants.
CO 5 Ability to identify, formulate and solve air and noise pollution problems.

Text Books

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science + science media LLC,2004.
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 2002.

Reference Books

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000.
4. M.N Rao and HVN Rao, "Air Pollution",Tata Mcgraw Hill Publishing Company limited,2007.
5. C.S.Rao, "Environmental Pollution Control Engineering",New Age International(P) Limited Publishers,2006.

Web Resources

1. https://nptel.ac.in/courses/105105108/
2. https://nptel.ac.in/content/syllabus_pdf/105105108.pdf
3. https://nptel.ac.in/courses/112101095/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2				1	3					1	1	2
2	1	2	3		2	1	3					1	2	1
3	1	2	2		3	1	2					1	1	2
4	1	2	2		3	1	2					1	1	2
5	1	2	1		2		3					1	1	2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
Remember	20	20	20	20	20
Understand	50	50	50	50	50
Apply	30	30	30	30	30

Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

9. Explain the effects of CO, SO_2 and heavy metals on human being.
10. Write the sources and classification of air pollutants.

COURSE OUTCOME 2:

7. Discuss the atmospheric factors influencing the atmospheric dispersion of air pollutants.
8. Explain the role of meteorological elements in the dispersion of air pollutants in the atmosphere.

COURSE OUTCOME 3:

1. Draw the cyclone showing the design proportions and explain its working principle, advantages and limitations.
2. With a neat sketch, explain the principle, construction and working of an electrostatic precipitator.

COURSE OUTCOME 4:

1. Explain the criteria to achieve high performance in gas adsorption equipments.
2. Explain the environmental guidelines for setting of industries.

COURSE OUTCOME 5:

1. What are the sources of noise? How does noise become a pollution problem?
2. Explain the noise control methodologies.

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF HOURS REQUIRED
UNIT I - SOURCES AND EFFECTS OF AIR POLLUTANTS		
1	Structure and composition of Atmosphere - Definition, Scope and Scales of Air Pollution	2
2	Effects of air pollution on human beings, materials, vegetation, animals	2

3	Effects of air pollution on vegetation, animals, property, aesthetic value and visibility	2
4	Ambient Air Quality	2
5	Emission standards	1
UNIT II METEOROLOGY		
1	Effects of meteorology on Air Pollution - Fundamentals	1
2	Atmospheric stability, Inversion	2
3	Wind profiles and stack plume patterns	2
4	Atmospheric Diffusion Theories	2
5	Dispersion models, Plume rise	2
UNIT III CONTROL OF PARTICULATE CONTAMINANTS		
1	Factors affecting Selection of Control Equipment – Gas Particle Interaction	2
2	Particulates control - Working principle - Gravity Separators, Centrifugal separators Fabric filters	3
3	Fabric filters, Particulate Scrubbers, Electrostatic Precipitators	3
4	Electrostatic Precipitators	1
UNIT IV CONTROL OF GASEOUS CONTAMINANTS		
1	Factors affecting Selection of Control Equipment	2
2	Working principle - absorption, Adsorption	2
3	condensation, Incineration	2
4	Bio filters	1
5	Process control and Monitoring.	2

UNIT V INDOOR AIR QUALITY MANAGEMENT		
1	Sources, types and control of indoor air pollutants	1
2	sick building syndrome and Building related illness	3
3	Sources and Effects of Noise Pollution, Measurement – Standards	3
4	Control and Preventive measures	2

21CE7810	**DISASTER MANAGEMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisites for the course

- Nil

Objectives

3. To provide an exposure on the various elements of natural disasters
4. To impart knowledge on measurement, effect and management techniques for different disasters

UNIT I	**NATURAL DISASTERS**	**9**

Natural Disasters- Meaning and nature of natural disasters, Their types and effects - Flood, Drought and Desertification, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Mudflow, Natural fire ,Cyclone- Causes, effects and practical examples for all disasters

UNIT II	**MAN MADE DISASTERS**	**9**

CBRN – Chemical disasters, biological disasters, nuclear disasters- **Fire** – building fire, coal fire, forest fire, Oil fire -**Accidents**- road accidents, rail accidents, air accidents, sea accidents ,Major power breakdown- War-Causes, effects and practical examples for all disasters

UNIT III	**GEOSPATIAL TECHNOLOGY**	**9**

Remote sensing, GIS and GPS applications in real time disaster monitoring, prevention and rehabilitation- disaster mapping

UNIT IV	**RISK ASSESSMENT AND MITIGATION:**	**9**

Hazards, Risks and Vulnerabilities. -Disasters in and India ,Assessment of Disaster Vulnerability of a location and vulnerable groups- Preparedness and Mitigation measures for various Disasters- Mitigation through capacity building -Preparation of Disaster Management Plan

UNIT V	**DISASTER MANAGEMENT:**	**9**

Legislative responsibilities of disaster management- Disaster management act 2005- post disaster recovery & rehabilitation, Relief & Logistics Management; disaster related infrastructure development- Post Disaster, Emergency Support Functions and their coordination mechanism.

	Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**

1. Descriptive written exam	1. Assignments 2. Quiz	1. Descriptive written exam

Outcomes

Upon completion of the course, the students will be able to:

CO1: Differentiate the types of disasters, causes and their impact on environment and society

CO2: Develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

CO3: Assess vulnerability and various methods of risk reduction measures as well as mitigation

CO4: Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management

CO5: Integrate the role of different sectors in disaster prediction and preparation plans

Text Books

1. Ramana Murthy, "Disaster Management", Dominant, New Delhi, 2004.
2. Rajdeep Dasgupta, Disaster Management and Rehabilitation, Mittal Publishers, New Delhi, 2007

Reference Books

1. Disaster Management in India- A Status Report- Published by the National Disaster Management Institute, Ministry of Home Affairs, Govt. of India.2004.
2. Murthy D B N, "Disaster Management: Text and Case Studies", Deep and Deep Publications (P) Ltd., New Delhi, 2007.
3. Sundar I and Sezhiyan T, "Disaster Management", Sarup and Sons, New Delhi, 2007.
4. Khanna B K, "All You Wanted To Know About Disasters", New India Publishing Agency, New Delhi, 2005.

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	-	-	1	1	2	-	-	-	-	1	2		2
2	-	-	-	1	-	1	-	2	-	-	1	1		2
3	1	-	1	1	-	2	1	-	-	-	1	2		2
4	1	-	-	-	1	1	-	2	-	-	1	2		2
5	-	-	1	2	1	1	-	-	-	-	1	1		2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS	CAT 1	CAT 2	FAT 1	FAT 2	END SEM

CATEGORY					**EXAM**
Remember	30	30	30	30	30
Understand	30	30	30	30	30
Apply	40	40	40	40	40
Analyze					
Evaluate					
Create					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Differentiate hazard from disaster.
2. In December 2004, a tsunami brought havoc on 14 countries including India. Discuss the factors responsible for the occurrence of Tsunami and its effects on life and economy. In the light of guidelines of NDMA (2010) describe the mechanisms for preparedness to reduce the risk during such events

COURSE OUTCOME 2:

1. Define man made disaster and enumerate the reasons for industrial disaster .
2. Give examples of Manmade disaster.

COURSE OUTCOME 3:

1. Define GIS , GPS and remote sensing.
2. Explain in detail the applications of Geospatial technologies in different phases of real time disasters.

COURSE OUTCOME 4:

1. Define capacity building? What is need of capacity development?
2. Discuss in brief about risk, vulnerability and hazard assessments.

COURSE OUTCOME 5:

1. Discuss in detail about the emergency support functions and their coordinating mechanism.
2. Explain in detail about the Disaster Management Act 2005

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	DISASTER MANAGEMENT	NO OF HOURS REQUIRED
	UNIT I NATURAL DISASTERS	
1	Natural Disasters- Meaning and nature of natural disasters	1
2	Types and effects - Flood, Drought and Desertification	1
3	Earthquakes	1
4	Landslides and Avalanches	1
5	Volcanic eruptions, Mudflow	1
6	Natural fire	1
7	Cyclone- Causes, effects	1
8	Practical examples for all disasters	1
9	Case Study Discussion forum	1
	UNIT II MAN MADE DISASTERS	
1	**CBRN** – Chemical disasters	1
2	Biological disasters	1
3	Nuclear disasters	1
4	**Fire** – building fire, Coal Fire	1
5	Forest fire, Oil fire	1
6	**Accidents**- road accidents, rail accidents, air accidents, sea accidents	1

7	Major power breakdown	1
8	War-Causes, effects	1
9	Case studies related to Artificial Disaster	1
Unit III GEOSPATIAL TECHNOLOGY		
1	Introduction	1
2	Remote sensing	1
3	GIS	1
4	GPS	1
5	Applications of Geospatial Technologies in disaster Management	1
6	Geospatial Technologies in Disaster monitoring and prevention	1
7	Geospatial Technologies in Disaster prevention and rehabilitation	1
8	Disaster mapping.	1
9	Case studies (Discussion forum) related to applications of Geospatial Technologies in Real Time Disaster Phases	1
UNIT IV RISK ASSESSMENT AND MITIGATION		
1	Introduction	1
2	Hazards, Risks and Vulnerabilities	1
3	Disasters in India	1
4	Disaster Vulnerability in India	1
5	Assessment of Disaster Vulnerability of a location and vulnerable groups	1
6	Mitigation through capacity building	1

7	Preparation of Disaster Management Plans.	1
8	Discussion forum on disaster vulnerability assessment and disaster preparedness plans	1
9	Tutorial	1
UNIT V DISASTER MANAGEMENT:		
1	Introduction	1
2	Legislative responsibilities of disaster management	1
3	Disaster management act 2005	1
4	post disaster recovery & rehabilitation	1
5	Relief & Logistics Management	1
6	disaster related infrastructure development	1
7	Post Disaster, Emergency Support Functions and their coordination mechanism	1
8	Case Study	1
9	Tutorial	1